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Estimation of Eligibility for the WIC Program

Report of the WIC Eligibility Study

Summary of Data, Method and Findings

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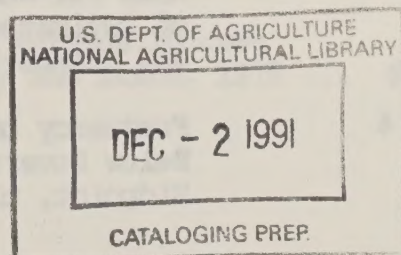
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Executive Summary

The Special Supplemental Food Program for Women, Infants, and Children (WIC) is a Federal-State nutrition and health-assistance program for low-income child-bearing women, infants, and young children. To be eligible, an applicant must meet three basic criteria:

- (1) Categorical—participants must be pregnant women (including the first 6 weeks after delivery), breastfeeding women up to 1 year after delivery, non-breastfeeding postpartum women up to 6 months after delivery, infants up to 12 months of age, or children up to their fifth birthday.
- (2) Income—the maximum Federal income limit is 185 percent of the U.S. Poverty Guideline (e.g., \$20,720 for a family of four as of July 1, 1987) but States may set lower standards corresponding to income limits used in their other health delivery programs. (Seventeen States currently set lower income limits for all or part of their WIC populations.)
- (3) Nutritional Risk—as certified by a health professional. Two major types of nutritional risk are recognized: medically based risk, such as anemia, underweight, maternal age, history of pregnancy complications or poor outcomes, etc.; and diet-based risk—inadequate dietary patterns, as determined by 24-hour-food-recall, food-frequency, or diet-history measurements.

The WIC Eligibility Study estimates, for the first time, the number of people eligible for WIC Program benefits based on all three criteria. Earlier estimates have been made of the population potentially eligible for WIC on income grounds, based on census data and general population birth rates. Such estimates unavoidably overstate the true number of persons fully eligible for WIC on the basis of both income and risk criteria.

The present study refines and expands the earlier estimates of WIC income-eligible persons, based on a special tabulation from the Full Detail File of the 1980 U.S. Census of Population and Housing. The special census data extract was prepared for the Food and Nutrition Service (FNS) by the U.S. Bureau of the Census. The present study estimated the number of income-eligible persons who would be found at nutritional risk, under representative WIC Program criteria, and thus be fully eligible for the program. The estimates of nutritional-risk frequency among the WIC target population groups (childbearing women, infants, and children ages 1-5) were made from national health and dietary survey data. Two recent, large-scale Department of Health and Human Services surveys were used: the 1976-80 Second National Health and Nutrition Examination Survey (NHANES-II) and the 1980 National Natality Survey/National Fetal Mortality Survey (NNS). The study does not include Puerto Rico, Guam, or the U.S. Virgin Islands, which have WIC Programs but may not be accurately represented by the national health survey data.

Three representative sets of the most prevalent or widely used operational criteria for nutritional risk in the WIC Program were determined from the 1984 WIC State Plans, one for each target population group. The frequency or prevalence of nutritional risk within each group, under these "modal sets" of risk criteria used in the WIC Program, was then estimated from the health and dietary survey data. These estimates of risk frequency under representative WIC

criteria were made for the specific income-eligible WIC population groups in each census geographic area (depending on the specific socioeconomic characteristics of each such group) as well as for the WIC income-eligible population nationally.

These estimates of risk frequency and resulting numbers of WIC eligibles do not reflect the differences that exist among States in their specific risk criteria defined for WIC eligibility, but rather their most widely shared elements. They provide a common baseline for comparing the eligibility levels in States to those that would exist under the most commonly used nutritional-risk criteria among the 50 States and District of Columbia. The "modal" risk estimates provide a consistent measure of WIC eligibility throughout the country, thereby reflecting the level of need on a common comparative basis in all areas.

The estimated numbers of persons eligible for WIC also are presented for three income/poverty levels (below 100, 100-130 and 130-185 percent of poverty) so that States using standards other than the 185-percent norm can estimate eligibility levels, by interpolation, under their own lower income limits.

The WIC Eligibility Study provides considerable detail on the characteristics of eligible population groups at all geographic levels for the 1979 baseline period. Breakdowns are provided by maternal and child age, race and Hispanic identity, and household income/poverty level. The estimates are based on the annual household incomes reported by the census, and correspond approximately to the average monthly level of WIC eligibility for the year. WIC Indian State Agencies are not treated separately, but are included within the State and national totals. The national totals represent the 50 States and District of Columbia, including the Indian areas. As noted, the outlying areas of Puerto Rico, Guam, and the U.S. Virgin Islands, which also have WIC Programs, are not included.

For the national level only, the study also projected the 1979 baseline estimates of WIC eligibility to estimated 1984 levels. The study describes the projection model used in "aging" the detailed baseline period estimates. This is done by applying the rate of change since 1979 in size of WIC target-group population, calculated from the annual income/poverty figures provided regularly from the Current Population Survey of the U.S. Bureau of the Census. In this way, regular detailed updates can be prepared of the estimated WIC-eligible population nationally. These updates are based on changes in income only; more recent health and nutritional status survey data are not available.

Comparable updated estimates are not available for States and local areas. While the national average rate of change since 1979 can be applied to produce approximate estimates of current WIC eligibility in these areas, such estimates cannot be regarded as accurate or valid unless the specific economic changes occurring in the particular area over the period, as compared with national-level economic changes, also can be factored into the estimate. Consequently, any such current-period State or local-area estimates projected from the baseline estimates of the present study should be developed and used with caution.

The estimated numbers of people fully eligible and participating in WIC nationally in 1984 are presented in table 1. Also shown is the level of program coverage — the estimated percentage of eligible people actually participating. Table 2 shows the estimated numbers of eligible persons in somewhat more detail. These figures should be interpreted as the number of persons eligible and participating in an average month during the year, as opposed to the (larger)

numbers that could be eligible or participating at some time during the year, or the (smaller) numbers eligible or participating throughout the year.

TABLE 1

Estimated Number of Persons Eligible for and
Participating in the WIC Program, 1984*/

	Fully Eligible	Participating in WIC	Program Coverage
	(in millions)		(percent)
WOMEN:			
Pregnant	0.74	0.34	46%
Breastfeeding (0-12 months)	0.38	0.10	27%
Postpartum (0-6 months)	0.41	0.19	46%
ALL WOMEN	1.53	0.64	42%
INFANTS (0-1 year)	1.21	0.81	67%
CHILDREN (1-5 years)	4.71	1.53	32%
TOTAL, ALL GROUPS	7.45	2.97	40%

SOURCE: FNS Administrative data, Study of WIC Participant Characteristics (FNS, 1986), and WIC Eligibility Study.

*/50 States and District of Columbia. Including Puerto Rico, Guam and the U.S. Virgin Islands would add an estimated 300,000 fully eligible and 400,000 income-eligible persons.

Key findings include:

- o An estimated 9.6 million persons were income-eligible for WIC in 1984. Just over three-quarters of these, 7.5 million or 77 percent, were estimated to be at nutritional risk, and hence fully eligible for WIC. (Including the outlying areas, some 10.0 million persons were income-eligible for WIC in 1984 and 7.8 million were fully eligible.)
- o An estimated 40 percent of the 7.5 million fully eligible women, infants and children participated in WIC in 1984. This is the estimated national average rate of coverage of eligible persons by the WIC Program in 1984; the rate of program coverage is likely to vary considerably among States and local areas.
- o The national average rate of coverage was highest for infants (67 percent) and pregnant and postpartum women (46 percent), indicating targeting of program benefits to the most critical participant categories. Breastfeeding women (27 percent) and children (32 percent) had lower coverage.

Estimated Number of Persons Eligible for the WIC Program, 1984
50 States and District of Columbia

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2e/ At nutritional risk under dietary risk criteria only (WIC Priority Levels IV-VI, not including Priority Level VII: Prevention of Regression).

The number of eligible persons should not be interpreted as the maximum number of people who would participate in WIC if funding were not constrained. Even in entitlement programs, such as the Food Stamp Program, a substantial number of eligible persons do not participate. For example, even among those persons who are enrolled for participation in the WIC Program, about 4-5 percent each month do not actually claim the benefits that are available to them.

The 1984 estimates can be compared with the 1979 baseline figures to assess changes in WIC Program coverage over the period.

- o Between 1979 and 1984 the estimated overall coverage rose from 27 to 40 percent of fully eligible persons.
- o The greatest growth in coverage occurred among breastfeeding and pregnant women and the least occurred among postpartum women and children.

The estimated WIC-eligible population and those persons participating in 1984 can be further subdivided by type of nutritional risk and by income/poverty level. Nutritional risk determined from medically based risk factors receives higher priority in the WIC Program (Priority Levels I-III) than nutritional risk based on dietary risk factors alone (Priority Levels IV-VI). The comparison of program coverage among these subdivisions of eligible persons indicates some additional dimensions of WIC benefit targeting, on average, at the national level. (As noted, the rates of program coverage at State and local levels may vary considerably from the national average.)

- o There is somewhat greater coverage among higher-priority eligible pregnant and breastfeeding women than among lower-priority ones. Estimated coverage of higher-priority eligibles in 1984 was:
 - 47 percent of higher-priority pregnant women, and
 - 29 percent of higher-priority breastfeeding women.
- o Participation increases markedly as incomes decline — i.e., poorer eligible persons are more likely to be served by the program. Estimated coverage by income/poverty level in 1984 was:
 - 53 percent of eligible persons below 100 percent of poverty,
 - 32 percent of eligible persons at 100-130 percent of poverty, and
 - 21 percent of eligible persons at 130-185 percent of poverty.
- o This effect is particularly marked for pregnant women and infants. Estimated coverage of these eligibles in 1984 was:
 - 66 percent of pregnant women below poverty, and
 - 87 percent of infants below poverty.
- o When high-priority nutritional risk and below-poverty income level are cross-tabulated, the estimated rate of WIC Program coverage in 1984 appears slightly greater:
 - 72 percent of higher-priority pregnant women below poverty, and
 - 88 percent of higher-priority infants below poverty.

Other major findings from the study include:

- o Overall, 77 percent of income-eligible people had at least one WIC nutritional-risk indicator. The estimated frequency of risk was highest among income-eligible women (91 percent), lower among infants (72 percent) and children (75 percent).
- o Among the estimated 7.5 million fully eligible persons:
 - 1.5 million (21 percent) were women,
 - 1.2 million (16 percent) were infants, and
 - 4.7 million (63 percent) were children.
- o Among the estimated 1.5 million eligible women:
 - 48 percent were pregnant,
 - 25 percent were postpartum and breastfeeding, and
 - 27 percent were postpartum up to 6 months and not breastfeeding.
- o Among the 7.5 million fully eligible persons:
 - 5.8 million (again, coincidentally, 77 percent) were estimated to be at risk on medically based criteria (that is, "higher priority" -- WIC Priority Levels I-III);
 - 1.7 million (23 percent) were estimated to be at risk on diet-based criteria only, (hence "lower priority" -- WIC Priority Levels IV-VI).
 - Many of the medically at-risk "higher-priority" eligibles also were at risk on dietary criteria, which was the most prevalent single risk factor observed in the NHANES data.

Insofar as this study uses data, especially health and dietary survey data, not specifically designed to measure WIC Program eligibility, its accuracy and reliability are limited to some extent. The estimates of people fully eligible under nutritional-risk as well as income criteria are limited by the applicability of the survey data and uncertainty as to the relationship of the estimates to the process of actual WIC Program eligibility determination in the field. Nonetheless, these are the best estimates of WIC eligibility that are available at this time.

A substantial set of Technical Appendixes are being prepared to accompany the present report, and will be forthcoming. These will serve to document in detail the data sources used, the various procedures and estimation methods applied, and technical aspects of the findings from the research. A separate volume of the detailed 1979 baseline estimates of WIC eligibility at State and county levels also is being prepared and will be forthcoming.

INTRODUCTION

The Special Supplemental Food Program for Women, Infants and Children (WIC) is a Federal-State nutrition and health assistance program for low-income childbearing women, infants, and young children. To be eligible for the program, an applicant must meet all three of the following basic criteria:

- (1) Categorical—participants must be pregnant women (including the first 6 weeks following delivery), breastfeeding women up to 1 year after delivery, nonbreastfeeding postpartum women up to 6 months after delivery, infants up to 12 months old, or children up to their fifth birthday.
- (2) Income--the maximum Federal standard is 185 percent of the U.S. Poverty Guideline (e.g., \$20,720 for a family of four as of July 1, 1987) but States may set lower standards that correspond to income limits used in their other health-delivery programs. Currently, 17 States set lower income limits than the national standard for all or part of their WIC population.
- (3) Nutritional Risk--as certified by a health professional. Two major types of nutritional risk are recognized: medically based risk, such as anemia, underweight, maternal age, history of pregnancy complications or poor outcomes, etc.; and, diet-based risk--inadequate dietary patterns, as determined by 24-hour-food-recall, food-frequency, or diet-history measurements.

The WIC Eligibility Study estimates, for the first time, the number of people eligible for WIC Program benefits based on all three criteria. The study has produced extensive, detailed estimates of the size and composition of the WIC-eligible population in the United States at county, State, and national levels (50 States and the District of Columbia). The estimates are based on the Full Detail File of the 1980 U.S. Census of Population and Housing, but they also draw on State-level Vital Statistics data, on national sample-survey data on breastfeeding and on the health and nutritional status of the population, and on the Census Bureau's Current Population Survey annual income/poverty data. Comprehensive estimates of the nutritional-risk status as well as income eligibility of the WIC target population groups are provided for the first time.

Given the complexity of the eligibility criteria in the WIC Program, the limitations in the available data, and the diversity that exists among States in the exact definitions of risk criteria for WIC eligibility, the study proved to be complex and technically difficult. It is limited in scope and essentially technical in nature. The study provides estimates of WIC Program coverage of the eligible population in 1979 and 1984 (participants as a percent of eligibles), but beyond that it does not address the various questions of program evaluation and analysis that the detailed estimates of WIC eligibility make possible. Rather, the study is limited to providing those estimates themselves in the most comprehensive, detailed and technically sound way that can be supported from existing sources of data.

Uses of Eligibility Estimates

Estimates of the number of persons eligible for the WIC Program are important in several ways. Although WIC is not an entitlement program, the size of the target population potentially eligible for WIC benefits provides a useful benchmark for measuring the program's effectiveness in reaching intended beneficiaries. State-level estimates of WIC eligibility, consistent across States, provide a basic measure of relative program need in different areas. Such estimates form a basis for assessing the geographic targeting of WIC benefits in relation to need. Similar estimates, based on U.S. Census data alone, have served as a component of the Federal funds-allocation formula used in the annual funding of State WIC programs. The more detailed estimates of WIC eligibility, by specific participant category and risk-priority level, provide a further basis for analyzing and assessing more detailed aspects of program need, effectiveness, and benefit targeting within the WIC Program.

Limitation of Previous Estimates

Previous estimates of WIC Program eligibility have been limited to those based on U.S. Bureau of the Census household income data and general population birth rates. Such estimates provide a good "first approximation" for the number of WIC-eligible persons, since the income/poverty level of potential participants is a major criterion for program eligibility. However, actual WIC eligibility depends on the physiological status of women, on the age of infants and children, and on the medical or dietary "nutritional risk" status of each individual applicant, as well as on income. Most of these factors are not directly

available in census or vital-statistics data. Consequently, estimates from these sources alone are not adequate to provide an accurate, fully detailed picture of the WIC-eligible population. Such estimates are unavoidably limited, in that they (1) tend consistently to overstate the true number of WIC eligibles; (2) provide only rough approximations of the potentially eligible population groups by specific WIC Program category; and (3) provide no way of distinguishing among potential eligibles by risk-priority level (i.e., medical vs. diet-based risk).

Objectives of the Study

The objectives of the WIC Eligibility Study have been to develop more complete and detailed estimates of the WIC-eligible population than previously were available, and to strengthen the conceptual and data bases for deriving such estimates from existing data sources, including regular current-period updates of the national estimates. In particular, the study provides:

- o estimates of the prevalence or frequency of nutritional risk among WIC target-group members;
- o State-level and local-area estimates for the 1979 baseline period on a consistent basis with the national estimates;
- o detailed estimates by the five physiological categories for WIC eligibility and by WIC Program risk-priority level (i.e., medically based nutritional risk vs. risk based on dietary inadequacy only);
- o detailed baseline figures and updating method for producing annual current-period estimates of the national WIC-eligible population, including one such annual update for 1984.

Although not an objective of the study, a useful by-product is a large set of descriptive information on the detailed socioeconomic characteristics of the WIC-eligible population at all geographic levels and on the nutritional-risk characteristics, breastfeeding practices, and other aspects of the WIC target population.

SOURCES OF DATA

Six major sources of data were used in developing the estimates of the WIC eligible population.

1. The 1980 U.S. Census of Population and Housing. A special tabulation from the Full Detail File of the decennial Census was prepared for FNS by the U.S. Bureau of the Census, providing detailed counts of the infants, children, and childbearing women who were income-eligible for WIC at county, State, and national levels on the basis of their 1979 annual household incomes.^{1/}
2. State-level Vital Statistics and National Breastfeeding Data. Selected State-specific vital statistics were used in estimating the number of women who were pregnant, on average, at any given time during the baseline period, from the census counts of childbearing income-eligible women in each geographic area. Similarly, breastfeeding-frequency data from the 1980 National Natality Survey

^{1/}For the exact specification of the census data extract, see the Technical Appendix volume for the WIC Eligibility Study, forthcoming. The baseline period for estimating the WIC-eligible population includes the demographic profile existing on April 1, 1980 (the decennial U.S. Census date), with the counts of income-eligible persons based on reported 1979 annual incomes. The convention for this case is to refer to "1979 eligible population." The Bureau of the Census poverty-income definition was followed in developing the 1979 baseline estimates of the present study rather than the DHHS/OMB "Poverty Guideline" standard of poverty income. The Poverty Guideline, which is used in the WIC Program, lags the more detailed Census poverty-line measure by approximately 1 year; with inflation, it thus tends to be slightly lower in any given year than the Census poverty measure. Using the Census poverty definition thus tends to overstate slightly the number of persons eligible in any given time period under the DHHS/OMB Poverty Guideline. This overestimate in baseline number of persons income-eligible for WIC was approximately 3 percent in 1979, averaged across WIC categories, and was corrected in projecting the estimated number of WIC-eligible persons to the 1984 period.

(described below) were used in combination with the census counts of postpartum women in each area to estimate the number of women up to 12-months postpartum who breastfed their infants (the WIC eligibility category of "breastfeeding" women) and those up to 6-months postpartum who never breastfed (the WIC category of "postpartum" women).

3. State WIC Agency Definitions of Nutritional Risk. The operational definitions of the nutritional-risk criteria used in WIC eligibility certification were taken from the 1984 Annual Plans of Operation submitted to FNS by the WIC State Agencies in each of the 50 States and District of Columbia. (The nutritional-risk definitions specified in a number of the larger Indian WIC State Agency Plans of Operation also were examined for comparability). From these separate definitions, a single common set of nutritional-risk criteria was formed for each WIC target-population group, representing the most widely prevalent or frequently defined risk criteria for determining WIC eligibility (the "modal set" of risk criteria) for each group.
4. National Sample Survey Data on the health, medical, pregnancy-history, and dietary status of WIC target-population groups. These data were used to estimate the frequency of nutritional risk under the "modal set" of WIC program risk criteria among members of each target group (childbearing women, infants, and children ages 1 to 5), both overall and as a function of the detailed socioeconomic characteristics of each group. Data were drawn from two large, nationally representative recent surveys: the Second National Health and Nutrition Examination Survey (NHANES-II, 1976-1980) and the National Natality

Survey/National Fetal Mortality Survey (NNS, 1980). Both surveys were conducted by the National Center for Health Statistics of the Department of Health and Human Services.

NHANES-II provides information on medically based nutritional-risk indicators for all childbearing-age women ($n = 4,161$), which served as a proxy for the physiological categories of women eligible for WIC, and for children aged 6 months to 5 years ($n = 3,160$). For the women's sample and for children above the age of 12 months, NHANES-II also provides dietary-intake data, both 24-hour recall and a weekly-food-frequency recall. The NHANES data set thus permits estimation of the overall frequency of nutritional risk for women and children age 1 to 5, both on medically based nutritional-risk criteria alone and on medical and diet-based risk criteria together. This is a key aspect of the NHANES data for the present study.

The NHANES data are limited, however, in providing only the medical-risk information for infants aged 6 to 12 months. Consequently, the direct NHANES data were used in estimating the frequency of medically based risk for infants in this age group, and a proxy estimate was developed for their frequency of nutritional risk on dietary-only risk criteria. The proxy used for the diet-only-based risk of infants aged 6 to 12 months was the comparable frequency of diet-only-based risk for children aged 12 to 24 months available in the NHANES data.

The National Natality Survey/National Fetal Mortality Survey (NNS) provides a large national sample of recently childbearing women ($n = 7,484$) with extensive information on health and pregnancy history and

birth outcomes. It includes a large subsample of breastfeeding women (n = 4,311) and general oversampling of low-income women. Thus, it is an appropriate sample for WIC target-group women. The NNS also provides medical data for the infants of these women through 6 months of age and, in particular, allows the nutritional risk of infants to be defined in part by the medically based risk status of the mother during pregnancy. This is quite important, as Mother's Eligibility for WIC During Pregnancy is the predominant nutritional-risk criterion used for infants' eligibility certification under WIC Program rules (Priority Level II).

The NHANES and NNS data sets are complementary in their coverage of the WIC target-population groups. They were used in conjunction in estimating nutritional-risk frequencies for all categories of WIC eligibles and in validating the risk-frequency estimates for women. For the estimation of lower-priority WIC eligible infants (at nutritional risk on diet-based criteria only) one additional data source was required: a recent national random sample of local WIC clinics' administrative records on WIC enrollments of eligible infants by risk-priority level.

5. Study of WIC Participant and Program Characteristics. This 1984 survey of local WIC Program administrative records was carried out by Ebon Research Systems for the Food and Nutrition Service, (FNS, 1986). A mixed multi-stage sampling method was used to develop a random sample of data from 28 States, 204 local WIC agencies, 356 WIC service sites, and 6,444 participant records. The present study used information from the WIC Participant Characteristics Study on the relative number of infants certified for eligibility in the WIC

Program under Priority Level IV (at risk on dietary criteria only) compared to those certified on medically based criteria, either for Priority Level I (medical risk of infant) or Priority II (WIC participation of mother during pregnancy, or medical risk of mother during pregnancy). This relative frequency of dietary-only risk as the certifying risk factor for infants participating in WIC was based on the risk factors documented in the initial WIC certification of infants up to 6 months of age. (Some 97 percent of all infants in this survey of local clinic records were initially certified for WIC within the 0-to-6-month age period.)

The data sets described so far provide the basis for estimating the detailed 1979 baseline populations eligible for the WIC Program under the combined categorical, income, and nutritional-risk criteria of the program at the county, State, and national levels. The national totals here represent the 50 States and District of Columbia. The outlying areas of Guam, Puerto Rico, and the U.S. Virgin Islands, which also have WIC Programs, are not included. The WIC Indian State Agency areas are not treated separately, but are included within the (geographic) State and national totals.^{2/}

^{2/}The underlying U.S. Census data on numbers of childbearing women, infants and children by age, race, Hispanic identity, and income/poverty level are available for the Indian areas, the outlying areas, and for SMSA's. These data provide a good first approximation for the WIC income-eligible populations in these areas in the baseline period.

The data sets described provide the basis for distinguishing among WIC eligibles in each geographic area along several dimensions: (1) by each of the five physiological categories for WIC eligibility; (2) by income/poverty level of target-group persons (below 100 percent of poverty level, 100 through 129 percent, 130 through 184 percent, and 185 percent or more of poverty level)^{3/}; and (3) by detailed socioeconomic characteristics (maternal and child age, race and Hispanic identity, as well as income)^{4/}. These are the basic descriptive characteristics that are available in common in the decennial U.S. Census data for each geographic area and in the national health and dietary sample-survey data. It is these common descriptor variables that provide the means for statistically linking the two separate kinds of data.

6. U.S. Bureau of the Census Current Population Survey (CPS)

The CPS provides annual data on the number of infants and children, nationally, by income/poverty level. The rate of change in number of infants and children, by age, in households below 185 percent of the DHHS/OMB Guideline is used to update the estimated 1979 baseline numbers of WIC-eligible persons at the national level by detailed WIC category.

(The rate of change in the number of target-group women below 185 percent of poverty is assumed to correspond to the rate of change in the number

^{3/}This specification differs slightly from WIC Program usage, which defines the maximum income standard for eligibility as 185 percent of the U.S. Poverty Guideline. The variation in estimated number of persons eligible under the income standard introduced by this difference in specification is imperceptible.

^{4/}The racial/ethnic categories established in the census data extract are White non-Hispanic, Black non-Hispanic, Asian and Pacific non-Hispanic, Native American non-Hispanic, and Hispanic. The estimation model for nutritional risk frequency from the national health survey data (described below) combines these into four racial/ethnic categories: White non-Hispanic, Black non-Hispanic, Hispanic, and Other.

of infants below 185 percent of poverty.^{5/}) The present study describes the estimation model for deriving annual updates of the WIC-eligible population at the national level (50-State and District of Columbia total) from the CPS and baseline data, and it provides one such set of recent-period estimates for 1984.

^{5/}The number of pregnant women below any given income/poverty limit at any particular time is approximately 45 to 50 percent of the number of infants, 0 to 12 months of age, in the same period (rather than the 75 percent that might be expected). This is due primarily to the differential "economy of scale" factor in the poverty-line measure for each woman's household size before and after the birth of her baby. However, since these differentials in the poverty-line measure by household size have remained essentially constant over time, the relative change over time in numbers of pregnant women and infants are not affected, and these two rates of change should correspond closely.

OUTLINE AND DESCRIPTION OF METHOD

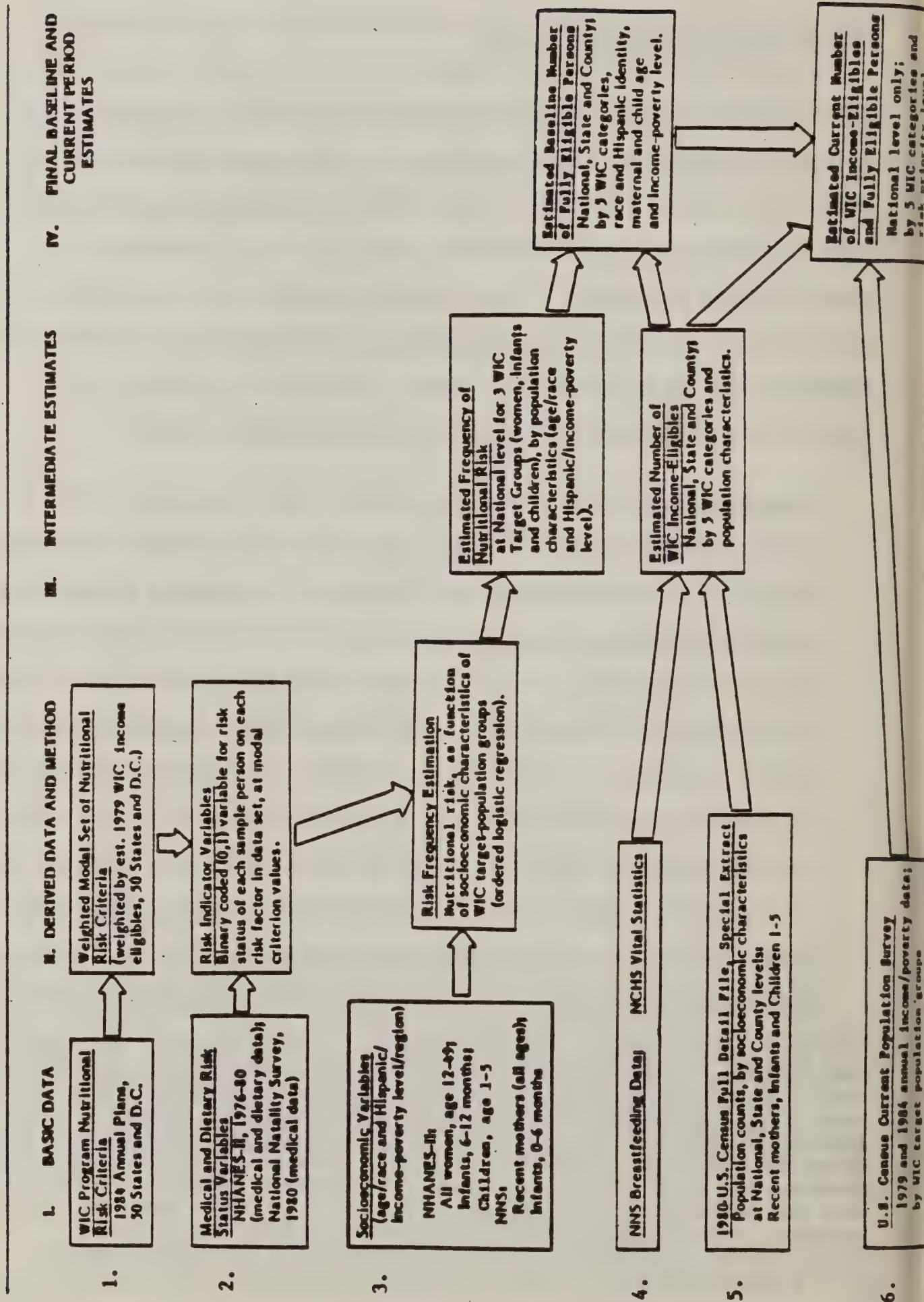
The various data sources described above are illustrated in figure 1, as well as the major steps that were required to reach the objectives of the study. The following describes in some detail the methods and procedures used to produce the desired estimates. (Each major step is numbered for cross-reference to figure 1.) More complete descriptions of these steps in the estimation procedure will be provided in a forthcoming set of Technical Appendixes for the WIC Eligibility Study. Limitations of the data and method for this estimation are described in a later section below.

Step 1. The first step in the estimation used the detailed 1980 U.S. Census data (figure 1, source 5), along with selected State-level Vital Statistics and breastfeeding data (source 4), to determine the baseline number of income-eligible persons in each of the five WIC target-population groups for each State and county in the United States and for the 50-State-plus-District-of-Columbia total. The direct census enumeration counts were used for infants and children ages 1 to 5 (i.e., up to their fifth birthday) in households below 185 percent of the Census poverty line. The total numbers of pregnant women, at all stages of gestation at a given point in time during the baseline period, were estimated from the counts of all women with infants up to 9 months old at the census date, adjusted by State-specific Vital Statistics for the period.^{1/} The income/poverty status of

^{1/}If there were no fetal or maternal deaths, no infant mortality or other removal from the household, and if birth rates were approximately constant (stable on a 9-month-moving-average basis) the census count would be an exact proxy for the total number of women pregnant at that given time. To approximate this, the census counts were adjusted (upward) by the rates of fetal and infant deaths, though not by other possible sources of infant disappearance or by temporal variation in birth rates. Maternal deaths were too few to affect the estimates (less than 1 per 1,000 pregnancies on average). For full description of the estimation model (steady-state Markov process with stable short-run parameters) and exact specification of the census-data extract, see the Technical Appendix volume, forthcoming.

FIGURE 1

Data Sources and Research Sequence in the WIC Eligibility Study



women with infants up to 9 months old was measured in the census extract data in terms of current household size minus one in order to project, retrospectively, the appropriate poverty-line dimension for the household during the period of the woman's pregnancy.

Two groups of postpartum women were counted: those with infants up to 6-months old and those with infants up to 12 months. For each group, the estimated frequency of breastfeeding was determined from the DHHS 1980 National Natality Survey (figure 1, source 4), differentiated according to race and Hispanic identity, maternal age, income/poverty level, and region. For postpartum women up to 6 months in each area, the WIC "postpartum" category was estimated by netting out the estimated number of women who ever breastfed. These in turn were summed with the estimated number of women in the 6-12-month-postpartum period who had continued breastfeeding beyond the sixth month to obtain the estimated total number of WIC "breastfeeding" women for each area.^{2/}

For each of the five WIC eligibility categories, the estimated numbers of WIC-eligible persons in each area are subdivided by age, household income/poverty level, and race and Hispanic ethnicity. The latter categories are integrated into five exhaustive population groups: White non-Hispanic, Black non-Hispanic, Asian and Pacific non-Hispanic,

^{2/}See the Technical Appendix volume (forthcoming) for detailed description of the estimation model for frequency of breastfeeding among postpartum women in the two time periods (a two-stage conditional probability model estimated by logistic regression).

Native American non-Hispanic, and Hispanic. The age groups for women are 18 years and under, 19 through 26, 27 through 35, and 36 years and over. For children, 1- 2- 3- and 4-year-olds are counted separately.

Step 2. The second step of the procedure produced three representative sets of the WIC Program's nutritional-risk criteria, one each for women, infants, and children. (For women, the risk criteria defined for pregnant women were used.) The risk criteria used in the WIC Program are established independently by each WIC State Agency under broad Federal statutory guidelines. To obtain the most representative of these for WIC eligibility, the weighted modal set of risk criteria was determined for each target population group, based on the definitions of nutritional risk set forth in the 1984 Annual Plans of Operation of the 50 States and the District of Columbia (source 1).^{3/}

The weighted modal criteria are intended to represent the most prevalent or typical current practice throughout the WIC Program nationally in defining "nutritional risk." The weighting is by estimated number of income-eligible persons in each target group in each State and the District of Columbia (from Step 1). The modal criteria thus represent the most prevalent standard or cutoff value for each risk factor in terms of the number of persons potentially affected by it, rather than by the number of States using it. (The more familiar unweighted mode based directly on number of States differs only slightly.)

^{3/}A more recent detailed development of the modal set of risk criteria defined in the WIC State Agency Plans of Operation for 1986 shows only slight change from the 1984 modal set.

Step 3. The "modal sets" of nutritional-risk criteria for each of the three broad WIC target groups (childbearing women, infants, and young children) were then applied to the data for medical and dietary risk factors from the two large DHHS surveys described above (source 2).

In this step, the nutritional-risk status, under the representative WIC program criteria, was determined for each WIC target-group member represented or proxied in the available national data. This risk-status determination for each individual was made separately for each risk condition indicated by the data (e.g., anemia, abnormal weight, substance abuse, etc. -- listed in detail below), forming a set of risk indicator variables for each person in the survey data.^{4/}

WIC eligibility depends on the presence of a positive risk condition under at least one recognized risk factor. Consequently, a positive risk condition indicated by any one of the risk indicators developed for the various risk factors at the WIC modal criterion level establishes a positive risk status for WIC eligibility for the individual. For each group of persons represented in the survey data, the overall frequency of nutritional risk within the group (or probability

^{4/}These risk indicators are binary-coded variables (0,1) indicating either the presence or absence of a risk condition, at the WIC modal criterion or cutoff level, for each separate risk factor.

of being at risk for members of the group) is then the proportion of all persons in the group having at least one positive risk indicator.^{5/}

Step 4. The same national health and dietary data sets were then used (level 3 in figure 1) to estimate the statistical relationships or "linkages" existing between the nutritional-risk status of WIC target-population-group members on the one hand, and their detailed socioeconomic characteristics on the other (maternal and infant's or child's age, race and Hispanic ethnicity, and household income/poverty level). In this step, the overall probability or frequency of being "at risk" under WIC Program criteria was estimated for each target population group, modeled as a function of the detailed socioeconomic characteristics of the group.^{6/} These estimates showed high levels of statistical significance in the relationships between overall risk

^{5/}It should be noted that frequency of particular risk factors is distinct from the relative seriousness of such factors for birth or health outcomes. However, many of the separate risks identified typically tend to co-occur in "at-risk" individuals. For example, nearly half the women with previous miscarriages in the NHANES data also have abnormal weight under WIC criteria, 59 percent of those with kidney disease have experienced miscarriages or have abnormal weight or both, and 69 percent of those at risk from smoking abuse are also at risk as indicated by kidney (renal) disorders and/or history of miscarriages and/or abnormal weight. Thus, a relatively prevalent but "less serious" risk indicator often may serve as an indirect indicator or "marker" (in the statistical sense) for a "more serious" risk condition (or conditions) as well.

^{6/}This step is necessary in order to project the estimated risk frequencies to State and local WIC target populations (as described below, step 5) and to maintain the validity of the estimates for the smaller socioeconomic subgroups within the national WIC population. However, for the overall national population as such in each broad WIC target group or proxy group, the estimated frequency of risk corresponds to the observed total frequency of risk (appropriately weighted) under the complete set of risk factors included in the data.

frequency and basic population characteristics in each of the broad WIC target groups.^{7/} Age was statistically the most significant differentiating variable for risk frequency, especially for women; race and Hispanic identity were the least significant. Annual income as reported in the census was generally statistically significant, or highly significant, as a determinant of overall risk frequency in each target group, but the magnitude of influence was slight. Region of country was included in preliminary trial estimates but was found to be generally not statistically significant as a determinant of risk frequency.

^{7/}The large majority of estimated regression coefficients were statistically significant consistently across the three target groups. (The regression coefficients measure the estimated independent influence of each determining variable on the overall probability or frequency of risk within the particular target group in each case). See Technical Appendixes (forthcoming) for complete description of regression models and results.

Number of Coefficients Estimated
and Statistical Significance Level

Variable	Total Number	.05 Level of Significance	.10 Level of Significance	Not Significant
Income	18	7	6	5
Age	15	12	2	1
Race, Hispanic	18	4	4	10
Intercept Terms	23	19	1	3

The estimation model developed in the study assigns greater weight to those risk conditions that most frequently tend to cluster or occur together in individuals (e.g., abnormal weight or weight gain, history of miscarriages, renal disorders, smoking abuse, alcohol abuse) and lesser weight to the more uncommon risk factors that tend to occur alone (e.g., history of multiple births, history of infant with congenital malformations).^{8/}

Two types of estimation were made at this stage for the women's and children's target groups: one estimating the overall frequency of risk under the medically based risk factors only, the other estimating overall risk frequency under the medically based and dietary risk criteria together. The estimated frequency of risk on the dietary criterion alone (WIC lower-priority risk, priorities IV-VI) was then computed as the difference between the two.

^{8/}This procedure identifies risk status in terms of an ordered categorical variable, scored from zero (no risk condition present) to (n) (the number of all risk factors in the data set) with the greatest weight (n) assigned to the factor with greatest frequency of coincident occurrence (i.e., greatest likelihood of also being an indirect indicator for other risk conditions). The rationale for the procedure is its capacity to "conserve information" across sparse sample cells, where missing-variables bias otherwise would limit the validity of the estimates for the smaller population subgroups in the sample. The estimation itself is full-information maximum likelihood, using standard logistic regression of the ordered categorical risk-status (or "risk-likelihood") variable on the socioeconomic population characteristics.

For infants, a different procedure was required since direct dietary data are not available for infants in either of the survey data sources. Consequently, proxy values for the frequency of infants' nutritional risk on grounds of dietary inadequacy alone were developed and used to compute the estimated numbers of WIC-eligible infants. Two independent data sources were used, one for infants up to 6 months old and one for infants aged 6 to 12 months. The proxy for younger infants is derived from a nationally representative sample of local-agency administrative data, including the Priority Level for infants enrolled in WIC at their initial certification (96.7 percent of WIC-enrolled infants were under 6 months old at the time of first certification). The proxy is based on comparing the numbers of Priority-IV infants (certified eligible on dietary grounds) and Priority-I and II infants (certified eligible on medical grounds).^{9/} The Priority-IV infants represented 4.6 percent of all infants up to 6 months old as initially certified eligible for WIC.

For the older infants, aged 6 to 12 months, the proxy for solely diet-based risk frequency was taken as the comparable risk frequency estimated from NHANES data for children aged 12 to 24 months (20.6 percent of all income-eligible 1-year-olds). For all infants from birth to age one, the overall proxy value for the proportion at risk on dietary grounds only (12.5 percent) was obtained by

^{9/}Study of WIC Participant and Program Characteristics (FNS, April 1986). This approach assumes that the relationship of diet-based risk to all certifiable nutritional risk (medical and dietary) is the same for the WIC-eligible population of infants as for actually enrolled WIC infants, and that this relationship is essentially constant across the relevant time period (1979-84) and across States.

averaging the separate values for younger and older infants, weighted to reflect the age distribution between the two groups.

For several reasons, there may be some degree of underestimation in the overall proxy value for infants' dietary risk derived in this way, and thus, in the final estimate of WIC-eligible infants in the present study.^{10/}

Step 5. The estimated frequencies of nutritional risk, as related to the basic socioeconomic characteristics of each WIC target group at the national level, were then used to estimate the unique frequency of nutritional risk for each specific WIC population group in each census geographic area, as determined by the actual characteristics of that particular group from the baseline census data of step 1.^{11/} That is, the nationally based estimates of nutritional-risk frequency were projected to the actual WIC income-eligible population groups within each county and State, as determined by their own specific socioeconomic characteristics. These frequency-of-risk estimates give the estimated proportion of WIC income-eligibles in each area who also

^{10/}The administrative data on infants enrolled in WIC based on poor diets (Priority IV) will to some extent underrepresent the proportion of infants in the target population who actually would be found to be at risk for poor diets under WIC criteria. This is because some States, due either to caseload limitation or policy decision, underserve the potentially eligible Priority-IV infants in their target populations.

^{11/}As estimated in step 5 and utilized in step 6, distinct risk-frequency estimates were generated for 144 separate subcategories within the WIC target-population groups: 64 subcategories of women, 64 of children, and 16 of infants. As noted, the differentiating characteristics are maternal and child age (4 groups each), race and Hispanic identity (4 categories), and annual household income relative to poverty line (4 levels).

meet the representative modal set of the WIC Program's nutritional-risk criteria and thus would be fully eligible, under these criteria, for WIC participation.

Step 6. The last step in determining the detailed 1979 baseline-period estimates of the WIC-eligible population consisted of a simple though massive computation. The estimated number of WIC income-eligibles in each population subgroup in each geographic area (step 1) was multiplied by the estimated frequency of risk for each such specific population subgroup (step 5). This computation gives the estimated baseline number of WIC income-eligibles who also meet the representative nutritional-risk criteria of the WIC Program and thus would be fully eligible under these criteria.

Step 7. Finally, the 1979 baseline estimates of the national WIC-eligible population were "aged" by means of the Census Bureau's annual Survey of Current Population (CPS) income/poverty data (source 6) to provide more current (1984) estimates of the fully eligible WIC population at the national level. The same method can be used to produce successive annual updates for the WIC-eligible population nationally as each new set of CPS annual income/poverty data becomes available.

Updating the Baseline Estimates

The method of "aging" the 1979 baseline estimates of WIC-eligible population utilizes the growth rate in WIC target population groups derived from the CPS annual estimates of infants and children ages 1 to 5 in households below 185 percent of the DHHS/OMB Poverty Guideline. These two target groups accounted directly for nearly four-fifths (79.4 percent) of the estimated fully eligible WIC population in 1984. The growth rate for target-group women between the baseline year (1979) and update year is assumed to correspond to the growth rate for WIC income-eligible infants between the two years (see note 5, page 12).

Growth rates are computed separately from the CPS data for the WIC target population groups below 100 percent of poverty, below 130 percent of poverty, and below 185 percent of poverty. In updating from the 1979 base year, the method appears to be sensitive to the distinction between income/poverty counts of persons in family units as opposed to households, but shows virtually no difference in growth rates based on the Census Bureau poverty-line or DHHS/OMB Poverty-Guideline definitions.^{12/}

^{12/}The 1979-84 growth rates for WIC income-eligible infants computed from the CPS Public Use Tapes for March 1980 and March 1985 show the following variations, depending on specification. The computations were made for FNS by Mathematica Policy Research, Inc.

	Rate of Change, 1979 to 1984		
	<u>Under Alternative Poverty-line Specifications</u>		
	Census Definition, Family-based Poverty Counts	DHHS/OMB Definition, Family-based Poverty Counts	DHHS/OMB Definition, Household-based Poverty Counts
Change in number of infants below:			
100% of poverty	+ 34.47%	+ 35.39%	+ 44.19%
130% of poverty	+ 33.98%	+ 32.07%	+ 41.57%
185% of poverty	+ 17.81%	+ 17.26%	+ 25.71%

Within the scope of the present study it was not possible to develop State or county estimates for the specific changes in economic conditions and population income distributions that have occurred since 1979 at those levels. The necessary data, or consistent estimates, for income distributions in State and local areas are not available apart from the decennial Census. Consequently, the detailed State-level and local-area estimates of WIC eligibility in the present study are limited to the 1979 baseline period. Estimates of the 1979-1984 change in WIC-eligible populations at State and local levels can be made to a first approximation by applying the average national change over the period, as estimated from the annual CPS data, to these baseline estimates. However, it should be noted that such approximate estimates of State or local changes in WIC eligibility over the period will not be accurate or valid unless the specific changes in economic conditions occurring in each particular area, relative to those at the national level, can be factored into the estimates. To the extent that specific State or local economic conditions are known to have improved more slowly (or more rapidly) than the overall change in national economic conditions over the same period, the initial approximate estimates of State or local change in WIC eligibility, based on national average change, must be adjusted upward (or downward) accordingly. As noted, this was beyond the scope of the present study.

RATIONALE FOR "MODAL" WIC NUTRITIONAL-RISK CONCEPT

The concept of program eligibility used in the WIC Eligibility Study reflects a consistent basis for nutritional-risk determination in all areas of the country. The basis chosen (the "modal set" of State risk criteria) aims to represent the most prevalent or typical operational definition of nutritional risk currently observed (1984) throughout the WIC Program.^{1/} However, while corresponding closely to the actual risk definitions set forth by many WIC State agencies, the modal set of risk criteria differs from the actual, less typical definitions used in many other States. Thus, the WIC eligibility estimates under this definition do not reflect the differences in practice concerning nutritional-risk determination that actually exist among the States, but rather their most commonly shared elements.

This approach is necessary to achieve WIC-eligible population figures that are consistent across States and that reflect relative need for WIC services on a common basis. It also provides a baseline from which variations in WIC eligibility under risk criteria that are either more or less stringent than the current "modal set" could be approximated. (Similarly, the present study provides estimates for a range of income/poverty levels at 100, 130, and 185 percent of poverty, so that States using income limits other than the standard 185 percent of poverty can, by interpolation, estimate their own actual income-eligible WIC populations.) Further research from the NHANES and NNS data sets, using the risk estimation model developed in the present

^{1/}The modal sets of the risk criteria defined in WIC State Agency Plans of Operation for 1984 and 1986 differ only slightly.

study, could identify more precisely the effects for WIC eligibility that would result from specified changes in, or existing interstate differences among, the particular nutritional-risk criteria that were applied.

THE MODAL SETS OF RISK CRITERIA

The specific nutritional-risk factors included in the "modal set" for each WIC target population group are listed in tables 1 and 2. These tables also show the percentage of all States and the District of Columbia that include each factor among their own risk criteria for WIC eligibility, and the weighted modal criterion or cutoff-value for each risk factor. The initial screen for including a risk factor in the modal set was that it be used by at least 50 percent of the States.^{1/} As noted, the modal values are weighted by the estimated income-eligible target populations in each State. They thus represent the most prevalent risk criteria in the WIC program in terms of number of people potentially affected, rather than in terms of the number of States using each factor.

Only part of the full set of modal risk criteria for each target population group was used in the estimation of overall risk frequency for the group, depending on data availability and feasibility. Table 3 shows the subset of risk criteria used in estimating overall frequency of nutritional risk among target-group women, and the independent population frequencies of these risk indicators in the NHANES and NNS data sets. In terms of their separate independent occurrence, the highest risk frequencies among women are for inadequate dietary pattern, abnormal weight (overweight or underweight), history of miscarriages and stillbirths, renal (kidney) disorders, abnormal weight gain in pregnancy, chronic medical conditions,

^{1/}This procedure results in the inclusion in the modal sets of all the risk factors that are recognized in common by 90 percent or more of WIC (geographic) State agencies.

TABLE 1

WIC Program Modal Nutritional-Risk Criteria ^{a/} for Childbearing Women ^{b/},
50 States and District of Columbia, 1984

Risk Criterion	Percent of States Using	Modal Cutoff Value	Reference Data
Anemia:			
Hemoglobin (g/100ml)	98.0	<11.0 g/	NHANESd/, NNSe/
Hematocrit (%)	100.0	<33.0 g/	NHANES, NNS
Underweight (pregravid wt/ht)	94.8	<90%	NHANES
Overweight (pregravid wt/ht)	88.3	>120%	NHANES
Weight Loss During Pregnancy	63.8	>2 lbs/mo.	NHANES
Low Weight Gain During Pregnancy	82.1	<2 lbs/mo.	NNS
Twin or Multiple Gestation	58.0		NNS
Medical Conditions:			
Toxemia, Preeclampsia	80.7		NNS
Hypertension	88.1		NHANES, NNS
Diabetes, Renal Disorders	91.0		NHANES, NNS
Chronic Conditions	50.7		NHANES, NNS
Mental Retardation	50.2		
Low Age at Conception	97.3	<18 years	NHANES, NNS
High Age at Conception	85.0	>35 years	NHANES, NNS
History of High-Risk Pregnancies:			
Low Birth Weight Infant	92.3	<2500 g	NNS
Premature Infant	79.5	<37 weeks	NNS
Stillbirth	78.9	1 or more	NNS
Miscarriage	74.9	1 or more	NHANES, NNS
Multiple Births	53.7	1 or more	NNS
High Parity	69.8	5 or more	NHANES, NNS
Closely Spaced Pregnancies	89.3	<16 months	NNS
Alcohol Abuse	84.6	>2 oz/day	NHANES, NNS
Drug Abuse	83.5		
Tobacco Abuse	63.5	>20 cig/day	NHANES, NNS
Inadequate Dietary Pattern	100.0	(f)	NHANES

Notes follow table 2.

TABLE 2

WIC Program Modal Nutritional-Risk Criteria ^{a/} for Infants and Children,
50 States and District of Columbia, 1984

Risk Criterion	Percent of States Using		Modal Cutoff Value	Reference Data
	for Infants	for Children		
Anemia:				
Hemoglobin (g/100 ml)	96.6	93.3	<11.0	NHANES ^{b/}
Hematocrit (%)	98.6	97.3	<34.0	NHANES
Low Birth Weight	90.0	—	2500g	NNS ^{c/}
Premature Birth	56.0	—	<37 weeks	NNS
Abnormal Growth Patterns:				
Obesity (percentile wt/ht)	83.4	77.5	>90th	NHANES
Underweight (percentile wt/ht)	97.3	93.0	<10th	NHANES
Short (percentile ht/age)	93.6	89.6	<5th	NHANES
Failure to Thrive	73.6	60.0		NHANES
Metabolic Disorders	64.3	65.4		NHANES
Nutrition-related Medical Conditions:				
Congenital Malformations	79.2	73.8		NHANES, NNS
Frequent Respiratory or Intestinal Problems	66.0	59.8	>3/year	NHANES
Cardiac Problems	67.4	(0.2)		NHANES
Child of Diagnosed Alcoholic Mother	58.5	(13.8)		NNS
Child of Diagnosed Drug-addicted Mother	58.5	(13.8)		
Infant Born to Mother in WIC	98.0	—		
Infant Born to High-Risk Mother, not in WIC	92.7	—		
Inadequate Dietary Pattern	100.0	100.0	(d)	NHANES ^{e/}

Source: WIC State Agency 1984 Plans of Operation, definitions of nutritional-risk criteria to be used in WIC eligibility certifications. For detailed definitions, see Technical Appendix volume, forthcoming.

Notes on following page.

Notes to Table 1

Source: WIC State Agency 1984 Plans of Operation, definitions of nutritional-risk criteria to be used in WIC eligibility certifications. See Technical Appendix volume, forthcoming, for detailed definitions of risk criteria.

a/Risk criteria listed by 50 percent or more of States. Modal values of criterion cutoff levels, weighted by estimated number of WIC income-eligible target-group women in each State and District of Columbia.

b/Values given (percent of States using and modal cutoff value) are those for pregnant women. Some values differ for breastfeeding women and postpartum (nonbreastfeeding) women. (See detailed specification in Technical Appendix volume, forthcoming.)

c/Varies by trimester in some States.

d/Second National Health and Nutrition Examination Survey, DHHS, 1976-80.

e/National Natality Survey and National Fetal Mortality Survey, DHHS, 1980.

f/Insufficient servings of the 4 basic food groups, based on weekly-food-frequency recall.

Notes to Table 2

a/Risk criteria listed by 50 percent or more of States. Modal values of criterion cutoff levels, weighted by estimated numbers of WIC income-eligible infants and children in each State and District of Columbia.

b/Second National Health and Nutrition Examination Survey, DHHS, 1976-80.

c/National Natality Survey and National Fetal Mortality Survey, DHHS, 1980.

d/Insufficient servings of the 4 basic food groups, based on weekly-food-frequency recall of child's mother or other responsible adult.

e/Dietary-intake data available for children aged 12 months and older.

and smoking abuse. (See the Technical Appendix volume, forthcoming, for definitions of all risk factors included in the modal sets.) Table 4 shows the comparable subsets of risk criteria, and their independent population frequencies in the survey data, used in estimating the overall frequencies of nutritional risk for infants and children.

For children as well as women, by far the most prevalent single risk indicator observed in the NHANES data is Inappropriate Dietary Pattern. Some 43 percent of children and 59 percent of women were at nutritional risk on grounds of inadequate diet. The dietary risk indicator was defined similarly for children and women in terms of frequency of servings of the basic-four food groups. The NHANES data include both 24-hour food recall and a weekly-food-frequency recall. The food-frequency data were used to determine the risk indicator for inappropriate dietary pattern, since the modal State plan identified insufficient servings of the four basic food groups as the most common type of WIC dietary risk criterion.

The modal values from the 1984 WIC State plans for inadequate dietary intakes, in terms of servings per day from the four basic food groups, were as follows:

	<u>for children</u>	<u>for pregnant women</u>
bread and cereals	less than 4	less than 3
fruits and vegetables	less than 4	less than 3
milk and dairy products	less than 3	less than 2
meats and protein sources	less than 2	less than 1

If the frequencies of average daily food consumption reported in NHANES, aggregated into the four basic food groups, fell below the modal criterion value for any of the groups, a positive risk condition was coded for the individual. (Also see note, page 84. A more complete description of

TABLE 3

Risk Indicators Used to Estimate Overall Risk Frequency,
Based on 1984 WIC Modal Set of Nutritional-Risk Criteria for Women

Nutritional Risk Indicators	Data Set and Population Frequency <u>a/</u>	
	<u>NHANES-II</u> (4,161 women ages 12-49)	<u>NNS</u> (7,484 women, up to 1 year postpartum)
<u>Available in Both Surveys: b/</u>		
History of Miscarriages, Stillbirths	19.8%	15.6%
Smoking Abuse	17.6	13.1
Chronic Conditions	11.3	18.7
High Parity	10.0	7.6
Alcohol Abuse	3.2	12.8
<u>Available in NHANES:</u>		
Inadequate Dietary Pattern	59.2	
Overweight	24.1	
Renal Disorders	18.9	
Underweight	14.4	
Hypertension	8.7	
Anemia	2.3	
Diabetes	1.4	
<u>Available in NNS:</u>		
Abnormal Weight Gain During Pregnancy		18.5
Closely Spaced Pregnancies		10.6
History of Low Birth Weight Infants		5.9
History of Multiple Births		1.9
History of Infant with Congenital Malformations		1.3
<hr/>		
Not at risk under any medical risk indicator except age <u>c/</u>	31.0%	27.3%
Not at risk under any medical or dietary risk indicator <u>c/</u>	13.6%	

Source: Sigma One Corporation, WIC Eligibility Study.

Notes on following page.

the use of the NEANES data to determine frequency of diet-based risk, under WIC Program modal criterion values, is provided in the Technical Appendix volume, forthcoming.)

Several things should be noted concerning the figures listed in tables 3 and 4. First, the individual risk-factor frequencies reported here represent the direct NEANES and NNS sample data, weighted to population totals, rather than weighted by the specific WIC target population of women used in the present study's estimation of risk frequency. The design of the present study does not include estimation of separate frequencies for the individual risk indicators identified for the WIC target population groups. Rather, it estimates the overall or total frequency of risk under any one or more of the individual risk factors in the survey data for each target population group.

Notes to Table 3

a/Independent sample frequencies, weighted to population totals, for individual risk indicators at WIC modal criterion levels.

b/Not all risk criteria included in the WIC modal sets are available in extant data, and not all risk factors included in the data were analyzed in the present study. In particular, several of the medical risk variables in the National Natality Survey and National Fetal Mortality Survey, with appropriate respecification can be made to correspond to WIC modal risk-criterion definitions; these variables were not analyzed within the scope of the present study.

c/Not including Young Pregnancy (<18) and Older Pregnancy (>35).

TABLE 4

Risk Indicators Used to Estimate Overall Risk Frequency,
Based on 1984 WIC Modal Set of Risk Criteria for Infants and Children

Nutritional-Risk Indicators	Data Set and Population Frequency ^{a/}		
	NNS	NEANES-II	
	Infants 0-6 Mo.	Infants, 6-12 Mo.	Children 1-5 Yrs.
Infant at Risk Because Mother was in WIC, or Medically at Risk, during Pregnancy	71.7%		
Low Birth Weight	5.9		
Congenital Malformation	1.3		
Multiple Birth	1.0		
Inappropriate Dietary Pattern		n.a.	43.1%
Frequent Respiratory/Intestinal Illness		14.6%	20.1
Anemia		14.3	11.3
Underweight (low weight for age)		13.8	12.3
Stunting (low height for age)		9.4	13.5
Underweight (low weight/height)		4.3	5.6
Congenital Disorders		3.6	5.6
Chronic Disorders		3.0	6.7
Overweight		1.1	6.2
Not at risk under any medical risk indicator	27.4%	53.7%	49.5% ^{b/}
Not at risk under any medical or dietary risk indicator			27.8%

Source: Sigma One Corporation, WIC Eligibility Study.

^{a/}Independent sample frequencies, weighted to population totals, for individual risk indicators at WIC modal criterion levels.

^{b/}All children, ages 6 months to 5 years.

Secondly, while the NNS sample of recently childbearing women corresponds closely to the specific WIC target groups of women, the NHANES sample does not. Rather, the broad NHANES sample of all women and girls of potential childbearing age serves only as an indirect proxy for the more specific WIC target categories of actual currently childbearing women and girls. The general effect of this for potential bias in the final estimates is discussed below (Limitations of the Data and Estimates). However, the reason for concern with such possible bias can be seen in the data of table 3.

The problem is that the separate or independent prevalence or frequency of particular risk conditions for target-group women, especially women during pregnancy, can differ considerably from the larger age-based sample of women. For example, the prevalence of anemia in the broader proxy sample is just 2.3 percent (under the WIC modal criterion for pregnant women), while in the small subsample of actually pregnant women in the NHANES data (n = 108) the prevalence rate for anemia under the same criterion is 25.5 percent (see table 5, below). This latter figure also is quite similar to the proportion of WIC-participating pregnant women for whom anemia is recorded as a certifying risk factor (28.5 percent) in a 1984 sample of WIC clinic records.^{2/} It is clear that for certain specific risk factors considered separately, the comprehensive age-based women's sample seriously underrepresents the actual frequency for pregnant women. This is particularly so for the important nutritional-risk factor of anemia during pregnancy.

^{2/}Study of WIC Participant and Program Characteristics, (FNS, 1986).

However, the extent of underestimation of the overall frequency of risk among pregnant women under the complete set of risk factors included in the survey data appears to be much less.^{3/} This seems to be attributable to the extensive co-occurrence or "overlap" among the separate risk indicators so that other risk factors tending to co-occur with anemia during pregnancy apparently serve effectively as indirect indicators for anemia. Most of the women missed under the anemia indicator as such appear nevertheless to be included in the overall frequency of risk under the entire set of risk factors in the data.

In a similar way, the separate medically based risk indicators for infants used from the NNS data (table 4) show virtually no independent occurrence apart from the single factor: Infant at Risk Because Mother Participated in WIC or was Medically at Risk During Pregnancy.^{4/} The one exception to this near-complete coincident occurrence or "overlap" among infants'

^{3/}In a validation test comparing the subsets of pregnant, postpartum, and breastfeeding women in the NHANES data with the broad sample of all child-bearing-age women, the overall risk frequency under all risk factors for the pregnant women exceeds that for all women by less than 4 percentage points. The overall risk frequency for the pregnant women in the NHANES sample also corresponds closely to the estimated overall risk frequency for WIC target-group women derived jointly from the NHANES and NNS data sets that is used in the present study in deriving the final estimated number of women fully eligible for WIC. (See below, Limitations of Data, for fuller description of validation tests concerning the estimated overall risk frequencies from NHANES and NNS data.)

^{4/}This risk indicator, as defined for the NNS data set, represents only the medically based risk status of the mother during pregnancy, also determined from the NNS data set, and not the mother's actual participation in WIC, which is not available in the NNS data. Consequently, the risk indicator as defined in the NNS data will slightly understate the actual combined frequency of infants' risk under the two WIC criteria, since some of the mothers who participated in WIC during pregnancy will have been certified for dietary risk only.

risk indicators is Congenital Malformations. Consequently, apart from the overwhelmingly important risk factor of Mother's Eligibility for WIC,^{5/} underrepresentation of the other specific risk factors for infants (other than Congenital Malformations) can have little or no biasing effect on the estimation of infants' overall risk frequency under all risk factors together.

The extensive co-occurrence or overlap among separate risk factors also makes it clear that the independent risk-factor frequencies listed in tables 3 and 4 are not simply summed to obtain the overall frequency of risk under all factors together. That would involve extensive double or multiple counting.

One other aspect of the separate, independent risk frequencies in the population survey data should be noted. These population frequencies for individual risk factors bear no necessary close correspondence to the frequency of use of the same factors at WIC clinics as the certifying risk conditions for WIC eligibility. This again is due essentially to the high prevalence of multiple risk occurrence among eligible persons, and the possibility that any particular risk condition may be recorded in the clinic file as the certifying factor among any of several positive risk conditions that an applicant may have. It is not known if there are any systematic decision rules (implicit or explicit) in making this choice in the actual practice of WIC clinics. The particular risk factor or factors recorded also will depend heavily, of course, on the sophistication and thoroughness of the certifying exam.

^{5/}With Mother's Eligibility for WIC included as a risk factor, infants' estimated overall medically based risk frequency is 73.0 percent; with the factor of mother's eligibility excluded, estimated overall frequency of infants' medically based risk is 7.9 percent.

The data that are available concerning the use of specific risk factors in the certification of WIC-participating pregnant women are shown in table 5. For comparison, the comparable risk frequencies from the NHANES and NNS data also are shown.⁶ The risk-factor frequencies for participating pregnant women are taken from a recent national sample of WIC client records. As presented in table 5, they include only those participant records that list multiple risk conditions (approximately 60 percent of participating pregnant women). This may produce some bias in these figures as a measure of the actual frequencies of individual risk factors among WIC participants. However, the records including only one risk factor are known to be even more seriously flawed as a measure of participants' actual risk status (see note, table 5). Including the latter would thus tend to produce even greater bias. For this and other reasons,^{6/} these figures should be used with caution.

Given this caveat, the data in table 5 nevertheless suggest broad correspondence between most risk factors as used in WIC certifications and as observed in the data for WIC target population groups (the NNS sample and NHANES pregnant women's subsample) and proxy population group (the NHANES broad age-based sample).

^{6/}The participant risk data are compiled from State/local records with diverse definitions of risk criteria.

TABLE 5

Nutritional-Risk Factors Recorded in WIC-Clinic Participant Records
Used in Certifying Pregnant Women, 1984, and Comparison with
Survey-Data Frequencies

Nutritional-Risk Factors, Ranked by Frequency of Use In Certification a/	Frequency In WIC Clinic Records a/	Frequency in Survey Data		
		NHANES All	NHANES Pregnant	NNS
Inadequate nutrient intake	60.2%	59.2%	47.2%	
History or presence of anemia	36.9	2.3	25.5	
Abnormal weight gain during pregnancy	35.5			18.5
Young gravida (under age 18) b/	22.1	23.5	11.7	5.0
Obesity	19.2	24.1	27.5	
Closely spaced pregnancies	15.8			10.6
History of negative birth outcomes	15.2			9.2
High gravida (many pregnancies) or parity (many births)	12.1c/	10.0	4.1	
Smoking	11.7	17.6	21.2	13.1
Other medical problems or conditions	7.8	(20+)e/	(20+)e/	
Underweight (low pregravid weight for height)	8.9	14.4	14.2	
Older gravida (over age 35) b/	3.9d/	26.0	6.9	3.6

Source: Study of WIC Participant and Program Characteristics, FNS, Office of Analysis and Evaluation, April 1986; (Table 5.2.2, pp. 104-6).

a/Frequency of use in certifications where multiple risk factors were recorded (approximately 60 percent of pregnant women in WIC clinic records). Clinic records showing one risk factor only were excluded due to high likelihood of error. (Approximately 10 percent of clinics restricted their recording of certifying risk condition to just one risk factor; others failed to record more than one factor even though approved or required by local agency policy.)

b/Varies in some States.

c/Combines High Gravida (8.6%) and High Parity (3.5%); may include some double counting.

d/Combines Older Gravida (2.6%) and Older Prima Gravida (1.3%); may include some double-counting.

e/Approximate.

ESTIMATED FREQUENCIES OF NUTRITIONAL RISK

For the women's and children's target population groups, two sets of risk-frequency estimates were made, the first based on medical risk factors alone and the second based on the medical and dietary risk factors together. The estimated risk frequencies from the first of these represent the proportion of higher-priority WIC income-eligible persons in each target population group. The difference between the two estimates for each target group represents the frequency of nutritional risk on the dietary criterion alone, with no medically based risk apparent. This differential measure gives the proportion of lower-priority WIC income-eligible persons in each target group.

For women, two estimates were made of medically based nutritional risk frequency, one from the NHANES data and the other from the NNS. To determine a single estimated risk-frequency value drawing on both data sets, the midpoint between the NHANES-based and NNS-based estimates was used.^{1/} The total or overall estimated risk frequency for women was then determined as the midpoint value for the estimated medically based risk frequencies plus the estimated added or incremental frequency of nutritional risk based on the dietary indicator only.

One additional aspect of the women's risk-frequency estimates should be noted: women in the youngest and oldest age categories (18 years and under and 36 years and above) are considered to be at medical risk in each of the

^{1/}In fact, the two separate estimates and the midpoints between them are each a family of estimated risk-frequency values, one for each of the 64 distinct socioeconomic subgroups within both the women's and the children's target population groups.

women's categories on grounds of age as such.^{2/} However, since age is an important general determining variable for overall risk frequency, it could not also be included as a separate individual risk indicator in the general risk frequency estimations. Rather, age as a risk factor was entered in a subsequent discrete step, assigning a risk frequency of 100 percent to the younger- and older-women's age groups.

Tables 6 and 7 show the overall frequencies of nutritional risk for women as estimated from the NHANES and NNS data sets, first separately and then in combination. The variations in estimated risk frequency by women's age and income/poverty level among the WIC income-eligible population also are shown. The order of the rows in these two tables corresponds to the sequence of estimation procedures followed in arriving at the final risk frequency estimates (summarized in step 4, above: "Outline of Method").

Figures 2-4 illustrate several aspects of the nutritional-risk-frequency estimation for women (in this case, limited to women below 100 percent of poverty), showing the estimated frequency of risk for each of four age groups. Figure 2 illustrates the relationship of medically based nutritional risk (which may or may not co-occur with diet-based risk) and overall nutritional risk based on either medical or dietary risk factors, or both. The difference between these two risk frequencies (the cross-hatched areas) represents the derived frequency based on dietary risk factors alone, corresponding to the lower-priority nutritional-risk categories of the WIC Program (priorities IV-VI).

^{2/}The modal value for Young Gravida (pregnancy) was determined to be under age 18. However, the census-based age category for younger women had earlier been defined as age 18 and under. This causes a slight overestimate of women's risk frequency under the modal set of risk indicators when applied to the census data cells as defined.

TABLE 6

Estimated Frequency of Nutritional Risk, by Age
Among Income-Eligible WIC Target-Group Women

Data Source and Type of Estimate	Women's Age Groups				All Ages
	<18	19-26	27-35	36+	
1. <u>National Natality Survey, 1980</u> Postpartum women, 10 medical risk indicators	.667	.711	.752	.821	.725
2. <u>NHANES-II, 1976-80</u> All women ages 12-49, 11 medical risk indicators	.493	.689	.811	.889	.716
3. <u>NHANES-II</u> All women ages 12-49, 12 medical and diet-based risk indicators	.810	.891	.915	.951	.894
4. <u>Solely-Diet-Based Risk</u> Added risk frequency based on dietary risk alone, NHANES (row 3 minus row 2)	.317	.202	.104	.062	.177
5. <u>NNS-NHANES Midpoint Medical Risk Estimate</u> (from rows 1 and 2)	.580	.700	.782	.855	.721
6. <u>Midpoint Medical Risk Estimate with Low and High Age as Risk Factors</u>	1.000	.700	.782	1.000	.771
7. <u>Total Risk Frequency</u> (row 4 plus row 5)	.897	.902	.886	.917	.898
8. <u>Total Risk Frequency with Low and High Age as Risk Factors</u> (row 4 plus row 6)	1.000	.902	.886	1.000	.913
Population weights, WIC income- eligible women (1980 Census)	.0299	.1712	.0865	.0184	.3060
Relative weight, WIC income- eligible women, by age group.	.0977	.5594	.2828	.0602	1.0000

Source: Sigma One Corporation, WIC Eligibility Study.

TABLE 7

Estimated Frequency of Nutritional Risk, by Income/Poverty Level
Among WIC Target-Group Categories of Women

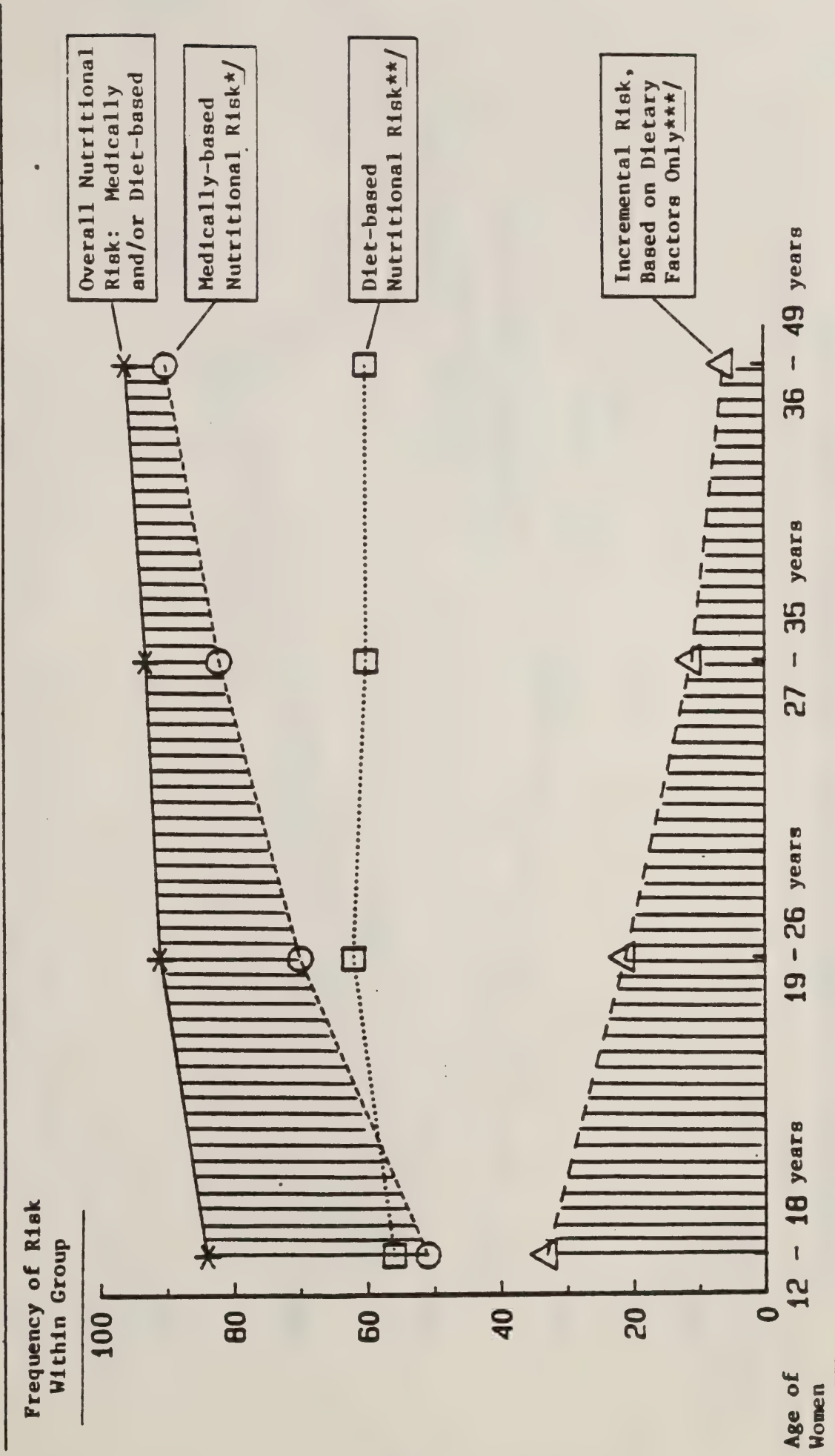
Data Source and Type of Estimate	Income/Poverty Level				
	<100%	100-129%	130-184%	<185%	185%+
1. <u>National Natality Survey, 1980</u> Postpartum women, 10 medical risk indicators	.753	.706	.702	.724	.731
2. <u>NHANES-II, 1976-80</u> All women ages 12-49, 11 medical risk indicators	.720	.719	.704	.714	.691
3. <u>NHANES-II</u> All women ages 12-49, 12 Medical and diet-based risk indicators	.911	.874	.881	.892	.862
4. <u>Solely Diet-Based Risk</u> Added risk frequency based on dietary risk alone, NHANES (row 3 minus row 2)	.191	.155	.177	.178	.171
5. <u>NNS-NHANES Midpoint Medical Risk Estimates</u> (from rows 1 and 2)	.736	.712	.703	.719	.711
6. <u>Total Risk Frequency</u> (row 4 plus row 5) ^{a/}	.928	.868	.880	.898	.882
Population weights, WIC income- eligible women (1980 Census)	.1287	.0576	.1197	.3060	.6940
Relative weight, WIC income-eligible women, by income/poverty level	.4206	.1883	.3911	1.0000	

Source: Sigma One Corporation, WIC Eligibility Study.

^{a/}These results correspond to row 7 in table 6.

FIGURE 2

Frequency of Nutritional Risk: Medically Based, Diet-based, and Combined, for Women Below 100 Percent of Poverty
Based on NHANES-II Data



* / May co-occur with diet-based risk.
** / May co-occur with medically based risk.
*** / Equals difference between overall and medically based risk frequencies.

FIGURE 3

Frequency of Medically Based Nutritional Risk for Women Below Poverty:
Comparison of Estimates from National Natality Survey and NHANES-II Data

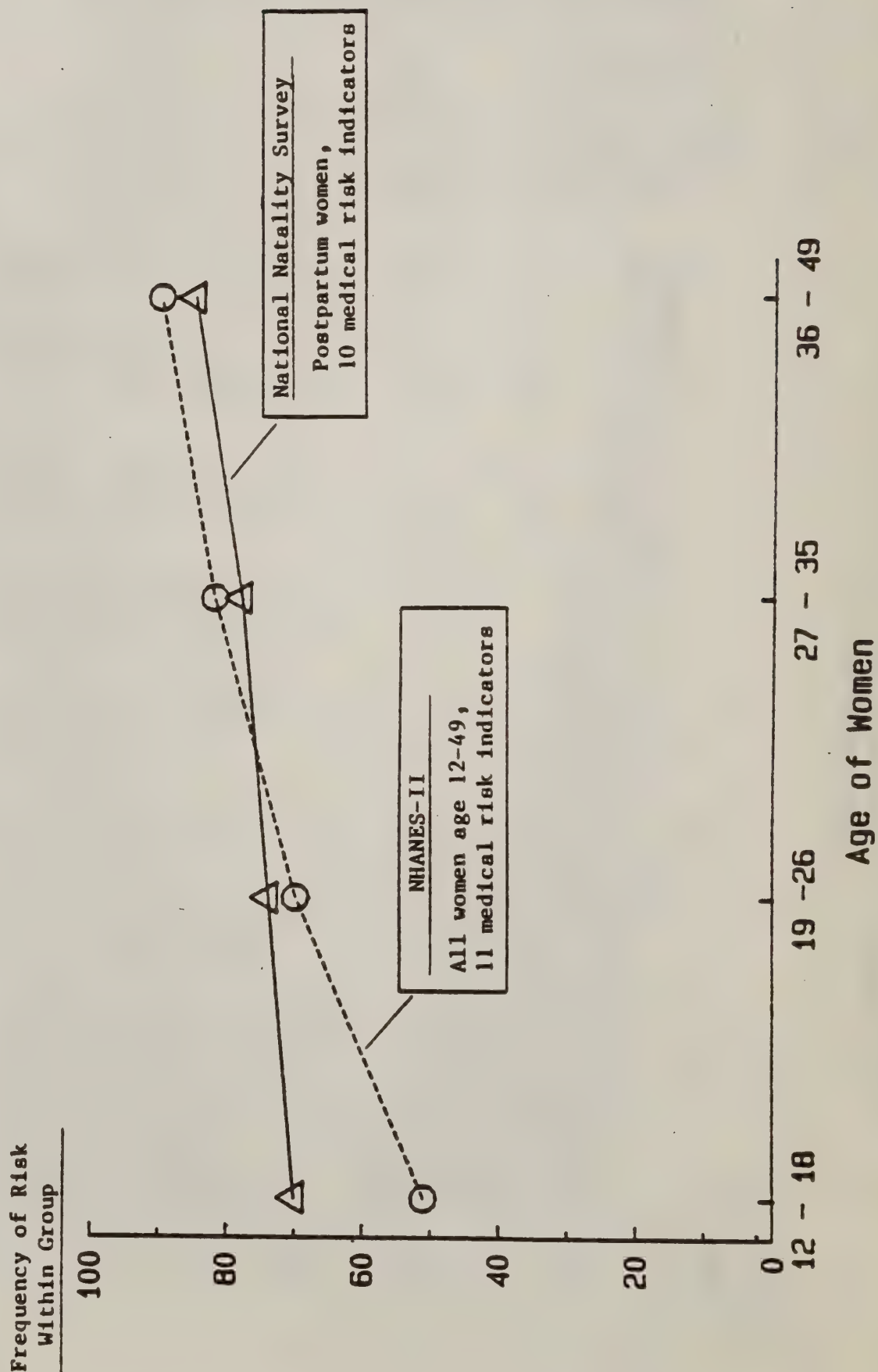


FIGURE 4

Frequency of Nutritional Risk for Women Below Poverty:
NNS / NHANES-II Medical-Risk Midpoint, plus NHANES-II Dietary Risk

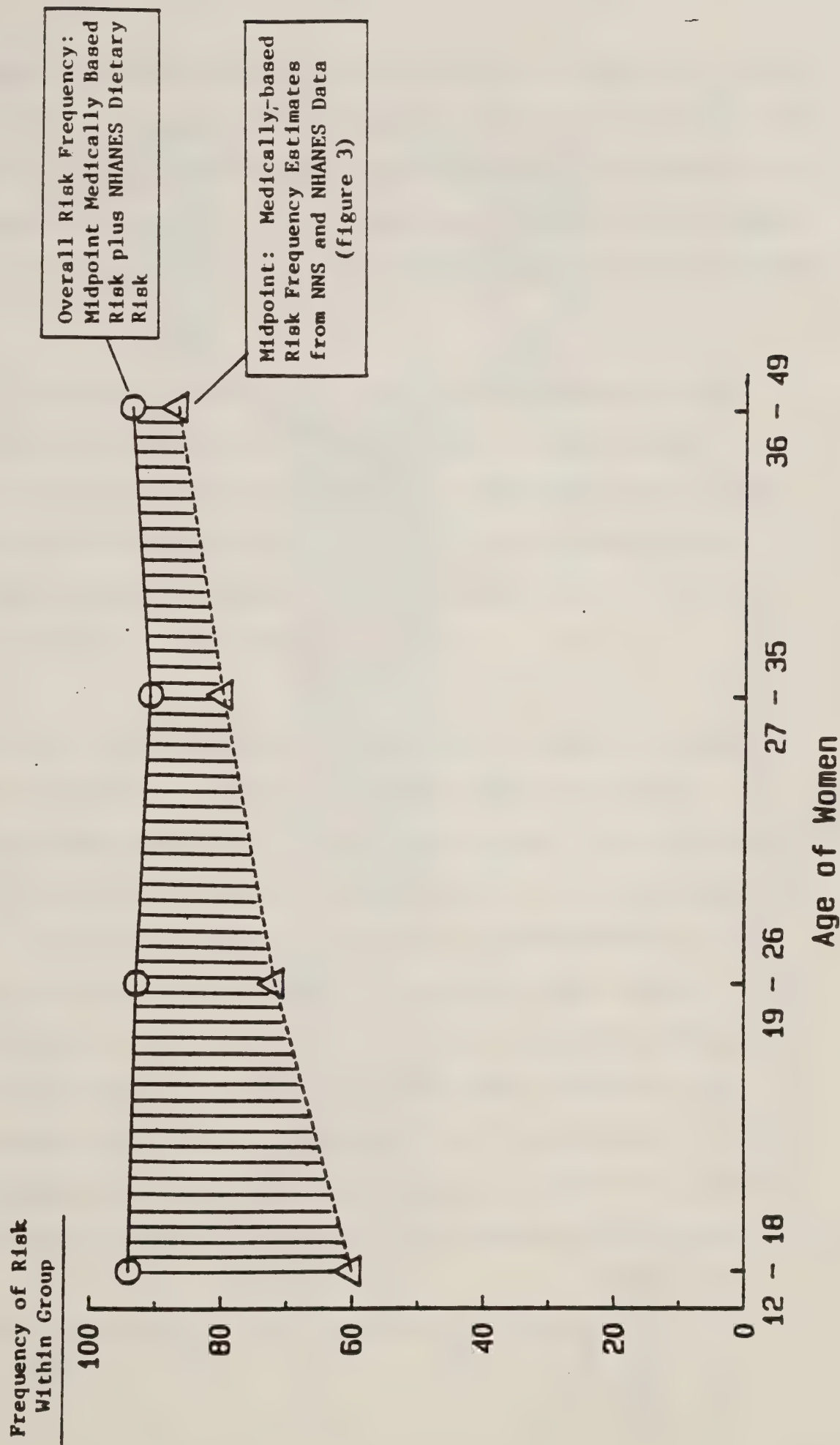


FIGURE 5

Frequency of Nutritional Risk for Infants and Children
Below 185 Percent of Poverty, by Age

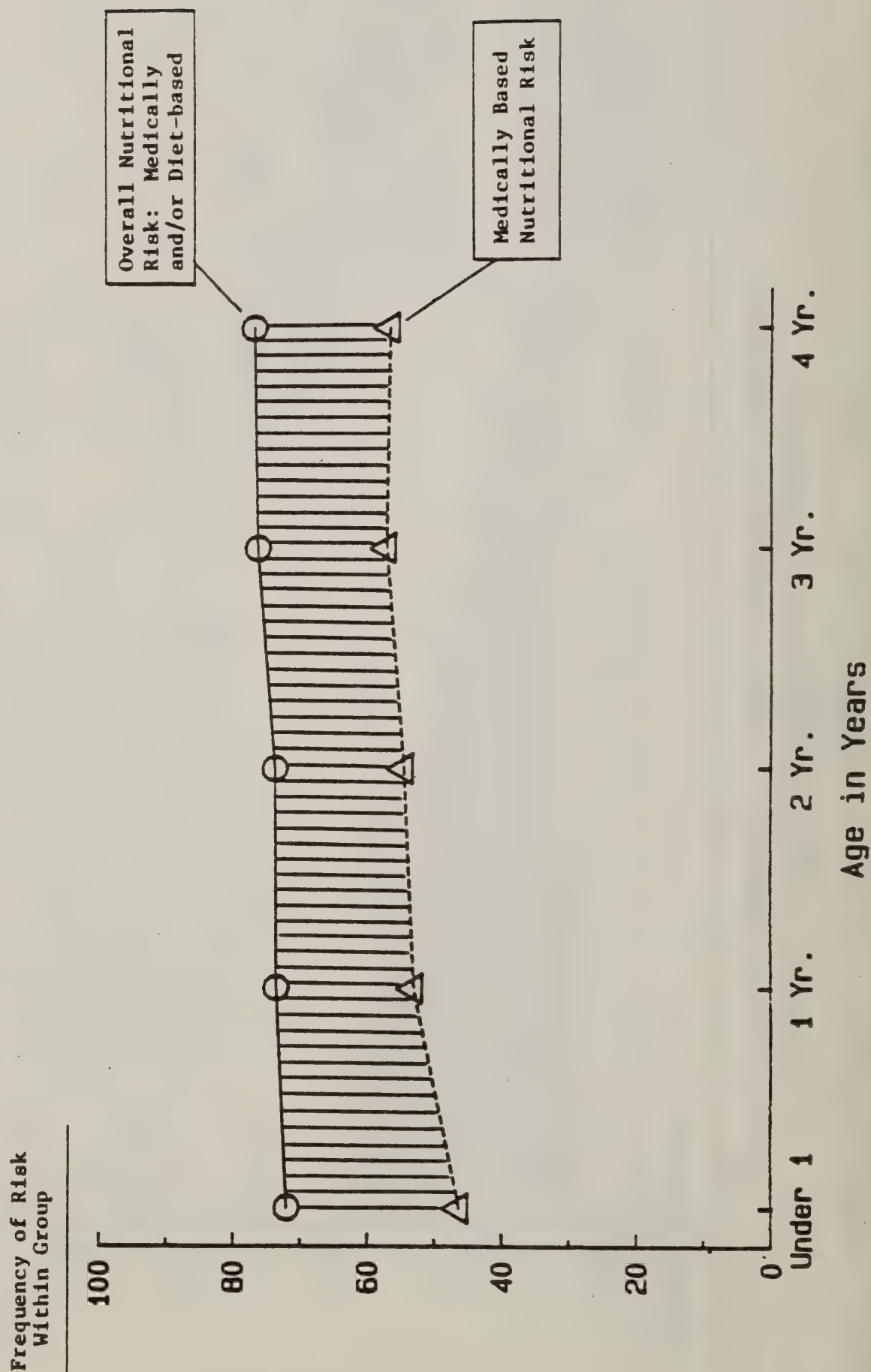


Figure 3 compares the medically based risk frequencies for women below poverty estimated from the 2 data sources while figure 4 shows the midpoint values for these 2 medically based risk estimates, plus the additional frequency of risk based on dietary factors alone. Figure 5 shows the comparable risk-frequency estimates for infants and children, in this case for all those income-eligible for WIC.

Tables 8 and 9 show the detailed final risk-frequency estimates for the complete matrix of socioeconomic subgroups of women, by age, poverty income level, and racial and Hispanic identity. Table 8 shows the figures as estimated before the inclusion of low and high age as explicit risk factors. Table 9 shows the estimated risk frequencies with age of women explicitly included as a risk factor.

Table 9 also shows the estimated risk frequencies for population groups aggregated to alternative income/poverty levels, rather than for the income/poverty strata separately, as in the other tables. The distinct effect of income for the estimated frequency of nutritional risk is perhaps best seen in table 9. While the influence of income level on prevalence of risk is statistically significant in all cases, the actual estimated magnitude of the effect is not large. For example, for WIC target-group Hispanic women in the 19-26-year-old age range and incomes below 100 percent of poverty, the estimated frequency of risk is 92.2 percent. For all such women up to 130 percent of poverty, the overall estimated frequency of risk is 90.5 percent; for all those up to 185 percent of poverty, 89.2 percent; and for similar women

TABLE 8

Estimated Proportion of Women at Nutritional Risk Under
Medical and Dietary Indicators

(derived from NHANES-II and NNS data)

Race/Age	Income Level (% Poverty)				
	<10%	100-130%	130-185%	<185%	185% +
All					
<= 18	0.938	0.845	0.867	0.900	0.852
19-26	0.932	0.872	0.884	0.902	0.888
27-35	0.911	0.861	0.871	0.885	0.874
36+	0.937	0.898	0.904	0.917	0.910
12-49	0.928	0.868	0.880	0.899	0.882
White					
<= 18	0.951	0.857	0.877	0.906	0.862
19-26	0.948	0.885	0.894	0.911	0.894
27-35	0.926	0.875	0.880	0.893	0.879
36+	0.946	0.912	0.918	0.928	0.919
12-49	0.943	0.881	0.890	0.908	0.888
Black					
<= 18	0.929	0.836	0.865	0.902	0.845
19-26	0.917	0.858	0.865	0.896	0.873
27-35	0.902	0.849	0.859	0.883	0.862
36+	0.934	0.898	0.902	0.920	0.901
12-49	0.917	0.858	0.868	0.896	0.869
Other					
<= 18	0.873	0.776	0.738	0.825	0.711
19-26	0.898	0.802	0.806	0.848	0.812
27-35	0.869	0.790	0.811	0.836	0.804
36+	0.920	0.853	0.873	0.896	0.874
12-49	0.889	0.799	0.803	0.843	0.804
Hispanic					
<= 18	0.923	0.821	0.843	0.887	0.815
19-26	0.922	0.854	0.862	0.891	0.859
27-35	0.903	0.840	0.854	0.875	0.849
36+	0.935	0.886	0.884	0.911	0.900
12-49	0.918	0.850	0.860	0.888	0.856

Source: Sigma One Corporation, WIC Eligibility Study.

TABLE 9

Estimated Proportion of Women at Nutritional Risk,
Including Low and High Age as Risk Criteria,
Aggregated to Alternative Income/Poverty Levels

(derived from NHANES-II and NNS data)

Race/Age	Income Level (% Poverty)			
	<100%	<130%	<185%	185% +
<u>All</u>				
<= 18	1.000	1.000	1.000	1.000
19-26	.932	.915	.902	.888
27-35	.911	.897	.885	.874
36+	1.000	1.000	1.000	1.000
<u>White</u>				
<= 18	1.000	1.000	1.000	1.000
19-26	.948	.927	.911	.894
27-35	.926	.909	.893	.879
36+	1.000	1.000	1.000	1.000
<u>Black</u>				
<= 18	1.000	1.000	1.000	1.000
19-26	.917	.906	.896	.873
27-35	.902	.892	.883	.862
36+	1.000	1.000	1.000	1.000
<u>Other</u>				
<= 18	1.000	1.000	1.000	1.000
19-26	.898	.877	.848	.812
27-35	.869	.853	.836	.804
36+	1.000	1.000	1.000	1.000
<u>Hispanic</u>				
<= 18	1.000	1.000	1.000	1.000
19-26	.922	.905	.891	.859
27-35	.903	.887	.875	.849
36+	1.000	1.000	1.000	1.000

Source: Sigma One Corporation, WIC Eligibility Study.

(Hispanic, WIC target categories, ages 19-26) with incomes greater than 185 percent of poverty (inclusive), the estimated risk frequency under the same WIC modal criteria is 85.9 percent.

Table 10 shows the overall frequencies of nutritional risk for children ages 1 to 5 as estimated from the NHANES data, with breakdowns by children's age and income poverty level.

TABLE 10
Estimated Frequency of Nutritional Risk Among Children

Type of Estimate and Children's Age	Frequency of Children's Nutritional Risk, by Household Income/Poverty Level				
	<100%	100-129%	130-184%	<185%	185%+
<u>Medically Based Risk (NHANES-II)</u>					
1-year olds	.560	.523	.497	.531	.471
2-year olds	.576	.537	.513	.546	.486
3-year olds	.600	.565	.540	.572	.514
<u>4-year olds</u>	<u>.595</u>	<u>.561</u>	<u>.535</u>	<u>.567</u>	<u>.506</u>
All Children Ages 1 to 5	.582	.546	.521	.554	.475
<u>Total Risk Frequency (NHANES-II)</u>					
<u>Medical and Dietary Risk Indicators</u>					
1-year olds	.747	.751	.715	.736	.690
2-year olds	.753	.744	.715	.738	.687
3-year olds	.772	.786	.744	.764	.721
<u>4-year olds</u>	<u>.777</u>	<u>.782</u>	<u>.754</u>	<u>.770</u>	<u>.729</u>
All Children Ages 1 to 5	.761	.764	.733	.752	.707
<u>Added Risk Frequency Based</u>					
<u>on Dietary Risk Alone</u>					
1-year olds	.187	.228	.218	.205	.219
2-year olds	.177	.207	.202	.192	.201
3-year olds	.172	.221	.204	.192	.207
<u>4-year olds</u>	<u>.182</u>	<u>.221</u>	<u>.219</u>	<u>.203</u>	<u>.223</u>
All Children Ages 1 to 5	.179	.218	.212	.198	.232

Source: Sigma One Corporation, WIC Eligibility Study.

ESTIMATED PROXY VALUES FOR INFANTS' DIETARY RISK

For infants, the absence of direct survey data on dietary intakes made an alternative estimation approach necessary, utilizing estimated proxy values for infants' frequency of nutritional risk on dietary grounds. Two such proxy estimates were developed, one for infants up to 6 months old and one for infants aged 6 to 12 months. For the younger infants, the proxy is derived from a nationally representative sample of local WIC agency administrative data,^{1/} including the priority level for infants enrolled in WIC at their initial certification (96.7 percent of enrolled infants were under 6 months old at the time of their first certification).

The proxy is based on comparing the numbers of Priority-IV infants (certified eligible on dietary grounds) and Priority-I and II infants (certified eligible on medical grounds). Infants who are at risk on both medical and dietary indicators may be expected to be certified in the higher-priority medical category. Thus, those infants who are certified for dietary risk may validly be presumed to have been qualified for WIC eligibility based on the dietary risk indicator alone. This approach to estimating, by proxy, the frequency of diet-based risk among the population of income-eligible infants assumes that the relationship of diet-based risk to all certifiable risk, medical and dietary, is the same for WIC-eligible infants as for actually enrolled WIC infants, and that this relationship was essentially stable from 1979 to 1984.

^{1/}Study of WIC Participant and Program Characteristics (FNS, 1986).

For the older infants, aged 6 to 12 months, the proxy for solely diet-based risk was taken as the comparable risk frequency estimated from NHANES data for children aged 12 to 24 months.^{2/} For all infants from birth to 12-months old, the overall proxy value for the proportion at risk on dietary grounds only was obtained by averaging the separate values for younger and older infants, weighted by the age distribution between the two groups. For several reasons, there may be some degree of underestimation in the final proxy value derived in this way and thus in the national-level estimate of WIC-eligible infants.^{3/}

Table 11 shows the estimated overall frequency of nutritional risk among infants, including the proxy values described for diet-based risk and the medically based risk frequencies estimated from the NNS data for infants under 6 months and from NHANES-II data for infants 6 to 12 months old.

^{2/}Administrative data also are available for the older infants, including their Priority Level upon most recent WIC certification. A proxy value for diet-based risk based on these data is broadly comparable to the value estimated directly from the NHANES data for 1-year-olds.

^{3/}The administrative data on infants enrolled in WIC based on poor diets (Priority IV) will to some extent underrepresent the proportion of infants in the target population who actually would be found to be at risk for poor diets under WIC criteria. This is because some States, due either to caseload limitation or policy decision, underserve the potentially eligible Priority-IV infants in their target populations.

TABLE 11

Estimated Frequency of Nutritional Risk Among Infants
Income-Eligible for WIC

Data Source and Type of Estimate	Frequency of Infants' Nutritional Risk, by Household Income/Poverty Level				
	<100%	100-130%	130-185%	<185%	185%+
<u>INFANTS, AGES 0-6 MONTHS</u>					
1. <u>Medically based Risk (NHS)</u> (including medically based risk of mother during pregnancy)	.750	.706	.704	.726	.733
2. <u>Diet-based Risk</u> (Clinic Records) Proxy value: based on proportion of WIC- enrolled infants in Priority IV.				.046	
3. <u>Total Risk Frequency</u> Medical and dietary risk indicators (row 1 plus row 2)				.771	
<u>INFANTS, AGES 6-12 MONTHS</u>					
4. <u>Medically based Risk (NHANES-II)</u> (not including nutritional risk of mother during pregnancy)	.490	.458	.432	.463	.404
5. <u>Diet-based Risk (NHANES-II)</u> Proxy value: frequency for 1-year-olds at risk on dietary risk alone.	.187	.228	.218	.206	
6. <u>Total Risk Frequency</u> Medical and dietary risk indicators (row 5 plus row 6)	.677	.686	.650	.669	
<u>ALL INFANTS, AGES 0-12 MONTHS</u>					
7. <u>Medically based Risk</u> (average, rows 1 and 4)				.595	
8. <u>Total Risk Frequency</u> Medical and dietary risk (average, rows 3 and 6)				.720	
9. <u>Added Risk Frequency</u> <u>Based on Dietary Risk Alone</u> (row 8 minus row 7, or average, rows 2 and 5)				.125	
Population weights (1980 Census)	.1822	.0709	.1413	.3944	.6056
Relative weight, WIC income-eligible infants by income/poverty level.	.462	.180	.358	1.000	

Source: Sigma One Corporation, WIC Eligibility Study; and Study of WIC Participant and Program Characteristics (FNS 1986).

SUMMARY OF MAJOR FINDINGS

The major findings for 1984 from the WIC Eligibility Study are presented in summary form in tables 12 through 14 and figure 6. Tables 12 and 13 give the national totals for the 50 States and District of Columbia based on 1984 annual levels of household income. They may be construed as representing the average size of the WIC-eligible population during 1984.^{1/} Figure 6 summarizes the same information graphically. Table 14 gives detailed breakdowns by income/poverty level for the estimated 1984 national WIC-eligible population, by category or target population group. It provides the estimated numbers of income-eligible persons, fully eligible persons (at nutritional risk on either-or-both medically based and dietary risk criteria), and higher-priority eligible persons (at risk under one or more medically based criteria: i.e., WIC priority levels I to III).

As described above, these estimates are based on the most prevalent income limit used by States for WIC eligibility (185 percent of poverty, used by all but 17 States) and on that set of specific criteria for identifying nutritional risk (the "modal set") that represents the most prevalent or commonly recognized risk criteria for certifying WIC eligibility, as established by the 50 States and District of Columbia. This set of estimates thus provides a common baseline of comparison for WIC

^{1/}The outlying areas of Puerto Rico, Guam, and the U.S. Virgin Islands have WIC Programs but are not included in these national totals. They are estimated to have had approximately 400,000 persons income-eligible for WIC in 1984 and approximately 300,000 fully eligible persons. These rough estimates are based on the special data extract counts from the decennial U.S. Census for WIC target-group persons in the outlying areas, below 185 percent of the U.S. poverty line in 1979, with average U.S. nutritional-risk frequencies applied, reasonable 1979-84 WIC population growth rates assumed, and the final result broadly rounded.

TABLE 12

Estimated Number of Persons Eligible for the WIC Program, 1984
50 States and District of Columbia

WIC Target Population Groups

Estimates For:	Postpartum Breastfeeding					All Women	Infants	Children Ages 1-5	All Groups
	Pregnant Women	Women 0-6 months	Women 0-12 months						
All Income-Eligible Persons 185% of U.S. Poverty Guidelines	811,539	439,641	429,966			1,681,146	1,678,644	6,261,452	9,621,242
WIC Fully Eligible Persons At nutritional risk on either medical or dietary basis, or both, (distribution by target group)	740,608 (.099)	410,292 (.055)	382,296 (.051)			1,533,196 (.206)	1,208,468 (.162)	4,708,920 (.632)	7,450,584 (1,000)
Percent of Income-Eligible Persons	91.3%	93.3%	88.9%			1.2%	72.0%	75.2%	77.4%
WIC Higher-Priority Eligibles At nutritional risk on medically based criteria (Priorities I-III). (distribution by target group)	625,869 (.109)	348,977 (.061)	319,912 (.056)			1,294,758 (.225)	999,295 (.173)	3,467,987 (.602)	5,762,040 (1,000)
Percent of Fully Eligible Persons	84.5%	85.1%	83.7%			84.4%	82.7%	73.6%	77.3%
WIC Lower-Priority Eligibles At nutritional risk on dietary criteria only (Priorities IV-VI). (distribution by target group)	114,739 (0.68)	61,315 (.036)	62,384 (.037)			238,437 (.141)	209,173 (.124)	1,240,934 (.735)	1,688,544 (1,000)
Percent of Fully Eligible Persons	15.5%	14.9%	16.3%			15.6%	17.3%	26.4%	22.7%

Source: Sigma One Corporation, WIC Eligibility Study. Based on U.S. Census counts and State-level Vital Statistics for 1979-80, projected to comparable 1984 levels using U.S. Bureau of the Census Current Population Survey estimates for March 1980 and March 1985. WIC income eligibility based on 1979 and 1984 annual incomes. Nutritional-risk estimates based on 1984 WIC State Plans of Operation and National Health and Nutrition Examination Survey (NHANES, 1976-80) and National Natality Survey/National Retail Mortality Survey (NHANES, 1980).

TABLE 13

Estimated Number of Persons Eligible for the WIC Program, 1984, in Relation to WIC Income-Eligible Population and U.S. Population Totals, by WIC Target Groups

WIC Target Population Groups

Estimates For:	Postpartum Breastfeeding			All Women	Children Ages 1-5	All Groups
	Pregnant Women	Women 0-6 months	Women 0-12 months			
All Income-Eligible Persons	2,819,254	803,275	1,245,170	4,947,699	3,832,775	23,162,760
WIC Income-Eligible Persons	811,539	439,641	429,966	1,681,145	1,678,644	9,621,242
Percent of Population	28.8%	49.8%	37.2%	34.0%	43.8%	41.5%
WIC Fully Eligible Persons (At nutritional risk under modal WIC Program criteria.)	740,608	410,292	382,296	1,533,196	1,208,468	7,450,584
Percent of Population	26.3%	46.5%	30.7%	31.0%	31.5%	32.2%
Percent of WIC Income-Eligibles:						
Higher-Priority Eligibles	77.1%	79.4%	74.4%	77.0%	59.5%	59.9%
Lower-Priority Eligibles	14.1%	13.2%	14.5%	14.2%	12.5%	17.6%
All Fully Eligible Persons	91.3%	93.3%	88.9%	91.2%	72.0%	77.4%

Source: Sigma One Corporation, WIC Eligibility Study (see table 12).

a/ Estimated, based on Decennial U.S. Census counts for WIC target-group population categories at all income levels, and on growth factors from Current Population Survey, March 1980 to March 1985.

FIGURE 6

Estimated WIC Income-Eligible, Fully Eligible, and High-Priority Eligible Persons and Comparison with Total Population, by WIC Target Groups, 1984 (in millions)

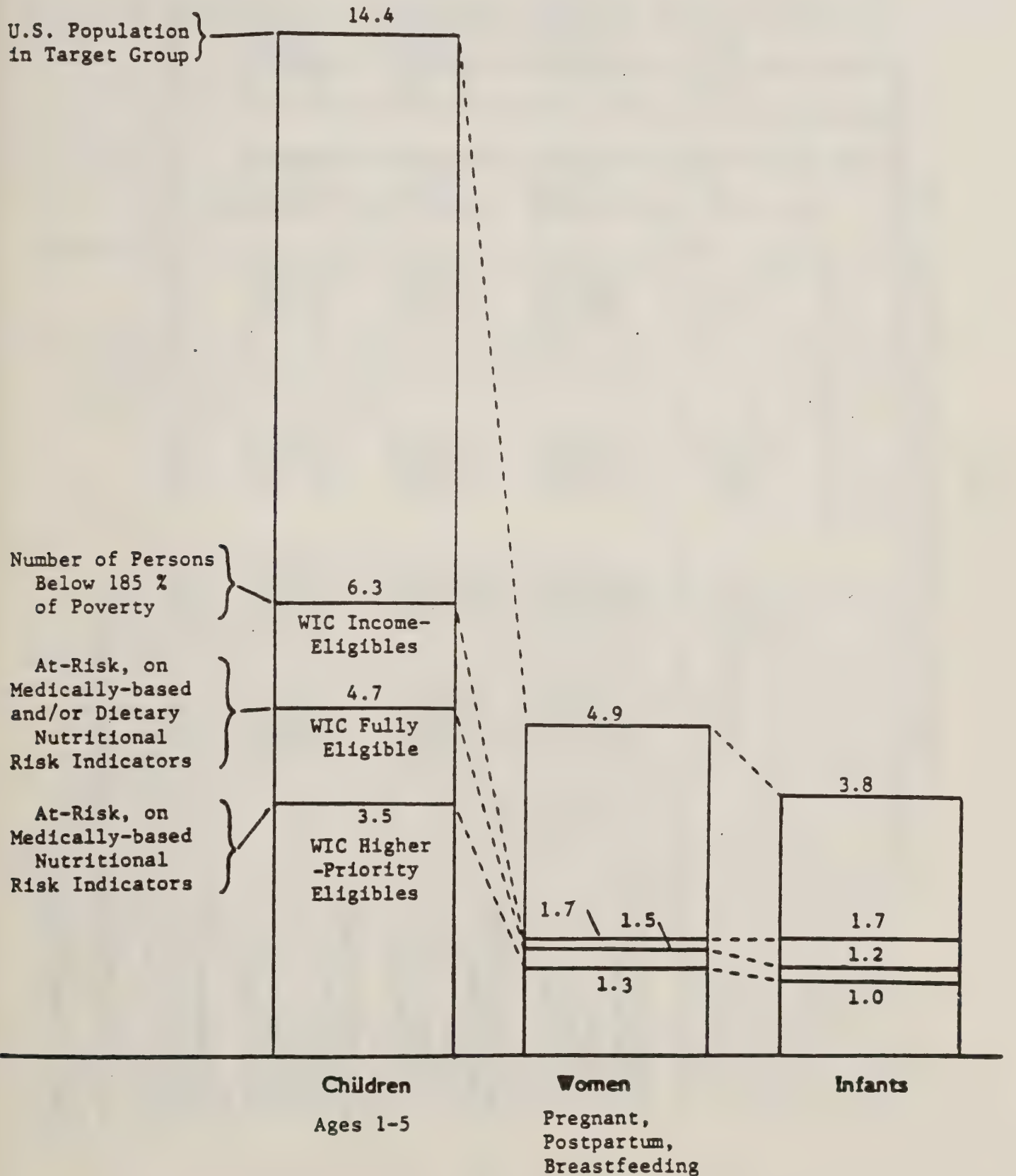


TABLE 14

Estimated Number of Persons Eligible for the WIC Program, 1984,
Income-Eligible, Fully Eligible, and Higher-Priority Eligibles, by Income/Poverty Level

Estimates For:	WIC Target Population Groups					
	Pregnant Women	Postpartum Women 0-6 months	Breastfeeding Women 0-12 months	All Women	Infants Ages 1-5	All Groups
<u>Income-Eligible Persons a/</u>						
<100% of Poverty	366,670	241,280	188,416	796,366	873,409	4,924,091
100-130%	178,111	89,348	95,742	363,200	346,876	1,835,557
130-185%	266,752	109,013	429,808	521,580	458,382	2,861,591
<185% of Poverty	811,539	439,641	429,966	1,681,146	1,678,644	9,621,242
<u>Fully Eligible Persons b/</u>						
<100% of Poverty	344,363	235,230	167,647	747,240	642,649	3,947,226
100-130%	158,778	79,760	84,268	322,806	249,460	1,395,888
130-185%	237,467	95,301	130,382	463,150	316,399	2,107,470
<185% of Poverty	740,608	410,292	382,296	1,533,196	1,208,468	7,450,584
<u>Higher-Priority Eligibles c/</u>						
<100% of Poverty	291,339	201,087	139,456	631,882	542,950	3,070,242
100-134%	136,972	68,968	72,016	277,955	202,081	1,120,076
130-185%	197,558	78,922	108,441	384,921	254,265	1,571,722
<185% of Poverty	625,869	348,977	319,912	1,294,758	999,295	5,762,040
<u>Regulation Group Totals</u>						
All Incomes	2,819,254	883,275	1,245,170	4,947,699	3,832,775	23,162,760

Source: Sigma One Corporation, WIC Eligibility Study.

Notes following Table 15.

eligibility, defined in terms that are both consistent and correspond as closely as possible to the predominant criteria for WIC eligibility established throughout the WIC Program.^{2/}

As with any estimates, the accuracy and reliability of the estimates presented in this report should be recognized as limited to some extent, owing primarily to limitations in the particular data available for making the estimation. The important limitations of the data and methods used in the study are described in detail below. Their overall effects for possible biases in, and reliability of, the final estimates also are noted.

The principal findings for 1984, presented in tables 12 and 13 and figure 6, may be summed up as follows:

^{2/}As noted, these estimates of WIC eligibility, based on the predominant prevailing income/poverty standard used in the program and on the "modal set" of the nutritional-risk criteria established by the States and District of Columbia for determining WIC eligibility, do not correspond to the actual WIC eligible populations of those States that use lower income/poverty limits than the norm, or that use nutritional risk criteria that are preponderantly either more or less restrictive than the norm. The present estimates do provide a baseline from which estimates of actual WIC-eligible populations can be constructed for States that use eligibility criteria that differ appreciably from the national norms. Moreover, if the actual WIC-eligible populations of all such States using atypical eligibility criteria were to be estimated and summed, the resulting national total WIC-eligible population should correspond closely to the national total derived in the present study. The number of income-eligible persons nationally would be slightly lower under the actual State WIC criteria, while the estimated frequencies of nutritional risk would be slightly higher, resulting in little if any change in the number of fully eligible persons nationwide. The higher overall risk frequency predicted under the collection of actual nutritional-risk criteria used by States, in comparison to the modal set, stems from the fact that the modal set is slightly more restrictive than alternative "midpoint" measures (e.g., median or mean values) of the range of actual risk criterion levels used by the 50 States and District of Columbia.

- o Altogether, an estimated 9.6 million persons were potentially eligible on income grounds for WIC Program participation on average during 1984.
- o Of these 9.6 million income-eligible persons, an estimated 7.5 million (77 percent) were fully eligible for WIC (i.e., met modal nutritional risk criteria as well as the income limit). These 7.5 million represent just under one-third of the entire U.S. population at all income levels of pregnant, breastfeeding, and nonbreastfeeding postpartum women, infants, and children under age 5.
- o The remaining 2.2 million (23 percent) of all income-eligible persons were not at nutritional risk, under either medically based or diet-based risk criteria, as represented in the national sample-survey data.
- o Among the estimated 9.6 million income-eligible persons, the estimated frequency of nutritional risk, and hence full WIC eligibility, varied considerably by target population group:
 - 91 percent of income-eligible women were fully eligible;
 - 72 percent of income-eligible infants were fully eligible;
 - 75 percent of income-eligible children were fully eligible.
- o Of the estimated 7.5 million WIC fully eligible persons:
 - 1.2 million (16 percent) were infants;
 - 4.7 million (63 percent) were children;
 - 1.5 million (21 percent) were women, among whom:
 - 48 percent were pregnant,
 - 27 percent were up to 6 months postpartum (not breastfeeding), and
 - 25 percent were up to 12 months postpartum and breastfeeding.

- o Among the 7.5 million fully eligible persons, an estimated 5.8 million (again, coincidentally, 77 percent) were at risk under at least one medically based nutritional-risk criterion, and thus may be considered "higher-priority" eligibles (eligible for WIC Priority Levels I-III).

The estimated proportion of higher-priority eligibles varied by WIC target population group, accounting for:

- 84 percent of fully eligible women;
- 83 percent of fully eligible infants;
- 74 percent of fully eligible children.

- o Of the estimated 5.8 million "higher-priority" WIC eligibles:

- 1.3 million (22 percent) were women;
- 1.0 million (17 percent) were infants;
- 3.5 million (60 percent) were children.

- o An additional 1.7 million persons (23 percent of all fully eligible persons) were estimated to be at nutritional risk based on dietary criteria only, and thus would be eligible for lower-priority WIC certification (Priority Levels IV-VI). Of these:

- 238,000 (14 percent) were women;
- 209,000 (12 percent) were infants;
- 1.2 million (74 percent) were children.

One important finding from the nutritional risk data that does not show up in the summary tables is the large extent of multiple or "overlapping" risk factors among those persons who are at nutritional risk. For example, 43 percent of higher-priority eligible children were at risk under at least two (and up to as many as five) separate medically based risk factors. Similarly, large proportions of the higher-priority eligible persons, at risk under at least one medically based factor, also were at nutritional risk under the dietary risk criterion as well: an estimated 27 percent of the higher-priority children and 42 percent of higher-priority women.

As noted above, the estimated fully eligible WIC population (7.5 million) amounts to just under one-third of the U.S. population in the WIC target categories (23.2 million) and this proportion is nearly constant across the three broad WIC target groups. By contrast, the fraction of total population that is income-eligible for WIC varies from 29 percent of pregnant women to 44 percent of infants and children. That is, a relatively larger proportion of infants and children than of childbearing women in the U.S. population meet the income criterion for WIC eligibility. However, the greater frequency of nutritional risk among women "evens out" this variation, resulting in nearly identical proportions of childbearing women, infants, and children in their respective U.S. population totals who are fully eligible for WIC Program participation.

Tables 15 through 17 present the 1979 baseline estimates from the study. Table 15 provides the detailed national totals by income/poverty level for the baseline period. Comparison of Tables 14 and 15 shows the estimated change in each segment of the WIC eligible population over the 1979-84 period. Table 16 provides the estimated WIC-eligible population in each State and the District of Columbia in the 1979 baseline period, and Table 17 provides baseline estimates of the income-eligible population in each State and District of Columbia by WIC category.

Estimated Baseline Number of Persons Eligible for the WIC Program, 1979,
Income-Eligible, Fully Eligible, and Higher-Priority Eligibles, by Income/Poverty Level

WIC Target Population Groups						
Estimates For:	Postpartum Breastfeeding		All		Children Ages 1-5	All Groups
	Pregnant Women	Women 0-6 months	Women 0-12 months	Women		
<u>Income-Eligible Persons a/</u>						
<100% of Poverty	265,700	174,839	136,532	577,071	632,899	2,289,507
100-130%	126,813	63,378	68,203	258,394	246,314	864,314
130-185%	269,816	120,591	146,177	536,584	490,794	1,777,606
<185% of Poverty	662,329	358,808	350,912	1,372,049	1,370,007	4,931,427
<u>Fully Eligible Persons b/</u>						
<100% of Poverty	249,536	170,455	121,482	541,473	465,683	1,745,594
100-130%	112,976	56,495	60,022	229,493	117,080	661,977
130-185%	241,927	107,905	130,503	480,335	343,515	1,301,105
<185% of Poverty	604,439	334,855	312,007	1,251,301	986,278	3,708,676
<u>Higher-Priority Eligibles c/</u>						
<100% of Poverty	211,113	145,714	101,054	457,881	393,438	1,333,477
100-134%	97,484	48,860	51,311	197,655	143,355	472,010
130-185%	202,199	90,240	108,728	401,167	278,771	925,848
<185% of Poverty	510,796	284,542	261,093	401,167	278,771	2,731,335
<u>Population Group Totals</u>						
All Incomes	2,555,186	800,542	1,128,540	4,484,268	3,473,774	12,639,754
						20,597,796

Source: Sigma One Corporation, WIC Eligibility Study.

Notes on following page.

Notes to Table 14

a/All persons below 185 percent of poverty, adjusted to correspond to the DHHS/OMB Poverty Guideline measure of poverty for 1984. (See Tables 15 and 16, note a.)

b/Estimated number of income-eligible persons who also are at nutritional risk, on either medically based or dietary grounds, under the "modal" set of the nutritional-risk criteria recognized by the 50 States and the District of Columbia for WIC eligibility certification.

c/Estimated number of income-eligible persons who are at nutritional risk under any one or more of the medically based risk factors included in the modal set of WIC Program nutritional-risk criteria. Postpartum women at medically based risk are included, although prior to 1985, by regulation, postpartum women were certified for WIC under lower priority levels only.

Notes to Table 15

a/All persons below 185 percent of poverty, based on 1979 annual household incomes, under U.S. Bureau of the Census definition of poverty income. The alternative count of persons below 185 percent of the DHHS/OMB Poverty Guideline measure of poverty, as used in the WIC Program, is approximately 3 percent lower. However, to the extent that the Poverty Guideline measure is applied to family or "economic" units within the larger household in actual WIC eligibility determinations, this differential will be offset to some extent or possibly reversed.

b/Estimated number of income-eligible persons who also are at nutritional risk, on either medically based or dietary grounds, under the "modal set" of the nutritional-risk criteria recognized by the 50 States and the District of Columbia for WIC eligibility certification.

c/Estimated number of income-eligible persons who are at nutritional risk under any one or more of the medically based risk factors included in the modal set of WIC Program nutritional-risk criteria. Postpartum women at medically based risk are included, although prior to 1985 postpartum women, by regulation, were certified for WIC eligibility only under lower risk priority.

TABLE 16

Summary: Baseline Estimates of the WIC-Eligible Population,
by State and District of Columbia, 1979

State	Number of Persons Income-eligible for WIC a/	Persons Fully Eligible for WIC b/	
		Number	Percent of U.S. Total
United States c/	7,673,483	5,946,255	100.0000
Alabama	176,987	137,546	2.3132
Alaska	15,318	11,882	0.1998
Arizona	112,594	87,433	1.4704
Arkansas	112,223	87,124	1.4652
California	802,236	621,594	10.4535
Colorado	87,474	67,638	1.1375
Connecticut	66,429	51,365	0.8638
Delaware	18,882	14,609	0.2457
District of Columbia	19,664	15,192	0.2555
Florida	308,583	238,995	4.0193
Georgia	236,010	183,137	3.0799
Hawaii	40,062	31,039	0.5220
Idaho	54,003	41,699	0.7013
Illinois	328,919	255,173	4.2913
Indiana	173,260	134,059	2.2545
Iowa	88,104	68,124	1.1457
Kansas	78,068	60,342	1.0148
Kentucky	157,733	122,825	2.0656
Louisiana	193,852	150,627	2.5332
Maine	44,836	34,531	0.5807
Maryland	101,478	78,379	1.3181
Massachusetts	136,767	105,478	1.7739
Michigan	264,560	204,749	3.4433
Minnesota	111,000	85,675	1.4408
Mississippi	147,122	114,445	1.9247
Missouri	162,150	125,519	2.1109
Montana	32,189	24,907	0.4189
Nebraska	53,472	41,313	0.6948
Nevada	21,846	16,790	0.2824
New Hampshire	25,383	19,564	0.3290
New Jersey	178,603	138,268	2.3253
New Mexico	70,032	54,462	0.9159
New York	573,740	445,335	7.4893
North Carolina	223,799	173,120	2.9114
North Dakota	26,201	20,262	0.3407

TABLE 16 - Continued

Summary: Baseline Estimates of the WIC-Eligible Population,
by State and District of Columbia, 1979

State	Number of Persons Income-eligible for WIC a/	Persons Fully Eligible for WIC b/	
		Number	Percent of U.S. Total
Ohio	323,203	250,461	4.2121
Oklahoma	118,475	91,943	1.5462
Oregon	83,119	64,149	1.0788
Pennsylvania	317,464	245,269	4.1248
Rhode Island	25,796	19,880	0.3343
South Carolina	137,850	106,734	1.7950
South Dakota	34,902	27,103	0.4558
Tennessee	180,363	139,782	2.3508
Texas	595,048	463,059	7.7874
Utah	94,877	73,186	1.2308
Vermont	19,184	14,770	0.2484
Virginia	163,761	126,572	2.1286
Washington	123,501	95,514	1.6063
West Virginia	71,928	55,810	0.9386
Wisconsin	126,988	97,847	1.6455
Wyoming	13,589	10,488	0.1764
United States c/	7,673,483	5,946,255	100.0000

Source: Sigma One Corporation, WIC Eligibility Study.

a/All persons below 185 percent of poverty level (U.S. Bureau of the Census definition) based on 1979 annual household incomes from the 1980 U.S. Census of Population and Housing, on selected State-specific Vital Statistics (for estimation of pregnant women) and on national survey data on breastfeeding (National Natality Survey, DHHS, 1980). These figures underestimate the WIC income-eligible population based on the DHHS/OMB Poverty Guideline definition of the poverty line by approximately 3 percent. (However, see Table 15, note a.)

b/Estimated frequency of nutritional risk among income-eligible persons in each WIC target population group, times the estimated baseline number of income-eligible persons in each group, summed across WIC categories.

c/Fifty States and District of Columbia. Indian WIC Agency populations are included in State figures and U.S. Total. The outlying areas of Puerto Rico, Guam and the U.S. Virgin Islands, which also have WIC Programs, are estimated to have had approximately 370,000 persons income-eligible for WIC in 1979 and approximately 285,000 fully eligible persons.

TABLE 17

Estimated Baseline Number of Persons Income-Eligible for WIC,
by Category and State, 1979

	Total	Infants Under 1 yr.	Children 1-5 Years	Pregnant Women	Postpartum Women			
					0-6 Months	Lactating		Total
						(0-6 Mos)	(7-12 Mos)	
United States	7,673,483	1,370,007	4,931,427	662,329	358,808	269,929	80,983	350,912
Alabama	176,987	31,984	113,111	16,341	8,475	5,614	1,463	7,077
Alaska	15,318	2,915	9,381	1,475	707	623	218	841
Arizona	112,594	20,809	69,552	10,820	5,514	4,564	1,336	5,900
Arkansas	112,223	19,876	72,258	10,238	5,048	3,716	1,087	4,803
California	802,236	144,519	511,731	70,441	38,291	28,550	8,705	37,255
Colorado	87,474	15,763	55,903	7,476	3,942	3,272	1,118	4,390
Connecticut	66,429	11,859	43,168	5,274	3,072	2,327	729	3,056
Delaware	18,882	3,386	12,236	1,631	850	600	180	780
District of Columbia	19,664	3,579	13,225	1,422	914	446	79	525
Florida	308,583	55,221	199,203	25,978	14,793	10,508	2,880	13,388
Georgia	236,010	42,830	151,255	21,164	11,300	7,501	1,960	9,461
Hawaii	40,062	7,262	24,871	3,786	1,963	1,707	473	2,180
Idaho	54,003	9,727	33,811	5,019	2,431	2,255	760	3,015
Illinois	328,919	60,164	211,693	26,929	16,080	11,032	3,021	14,053
Indiana	173,260	30,982	111,169	14,745	7,855	6,510	1,999	8,509
Iowa	88,104	15,531	56,311	7,577	3,980	3,598	1,108	4,706
Kansas	78,068	14,157	49,286	6,956	3,600	3,060	1,009	4,069
Kentucky	157,733	27,754	100,281	15,266	6,913	5,713	1,807	7,520
Louisiana	193,852	35,902	123,872	16,825	9,697	6,124	1,432	7,556

TABLE 17 - Continued

Estimated Baseline Number of Persons Income-Eligible for WIC,
by Category and State, 1979

	Total	Infants Under 1 yr.	Children 1-5 Years	Pregnant Women	0-6 Months	Postpartum Women		
						Lactating		Total
						(0-6 Mos)	(7-12 Mos)	
Maine	44,836	7,524	29,653	3,628	1,785	1,657	590	2,247
Maryland	101,478	18,830	65,555	8,425	4,594	3,150	924	4,074
Massachusetts	136,767	23,206	91,592	9,636	5,891	4,827	1,615	6,442
Michigan	264,560	46,402	173,331	20,652	12,141	9,192	2,843	12,035
Minnesota	111,000	19,434	71,664	9,134	4,887	4,442	1,439	5,881
Mississippi	147,122	26,594	94,546	13,351	7,236	4,393	1,002	5,395
Missouri	162,150	29,067	103,878	14,380	7,212	5,778	1,836	7,614
Montana	32,189	5,904	20,299	2,807	1,405	1,296	478	1,774
Nebraska	53,472	9,609	33,814	4,580	2,526	2,242	701	2,943
Nevada	21,846	3,898	14,178	1,762	955	785	268	1,053
New Hampshire	25,383	4,400	16,228	2,202	1,143	1,087	323	1,410
New Jersey	178,603	30,916	117,873	13,844	8,392	5,814	1,764	7,578
New Mexico	70,032	13,354	43,295	6,636	3,345	2,536	867	3,403
New York	573,740	100,457	372,656	46,985	28,278	19,653	5,711	25,364
North Carolina	223,799	39,641	145,546	19,363	10,032	7,127	2,091	9,218
North Dakota	26,201	4,577	16,688	2,426	1,126	1,031	354	1,385
Ohio	323,203	57,790	206,979	27,769	15,047	11,927	3,692	15,619
Oklahoma	118,475	21,220	74,537	11,103	5,649	4,617	1,350	5,967
Oregon	83,119	14,931	53,730	6,739	3,481	3,121	1,117	4,238
Pennsylvania	317,464	55,324	208,209	25,635	13,639	11,016	3,642	14,658

TABLE 17 - Continued

Estimated Baseline Number of Persons Income-Eligible for WIC,
by Category and State, 1979

	Total	Infants Under 1 yr.	Children 1-5 Years	Pregnant Women	0-6 Months	Postpartum Women		
						Lactating		Total
						(0-6 Mos)	(7-12 Mos)	
Rhode Island	25,796	4,348	17,115	2,053	1,059	899	323	1,222
South Carolina	137,850	24,779	89,112	11,775	6,723	4,360	1,101	5,461
South Dakota	34,902	6,283	21,786	3,327	1,580	1,437	490	1,927
Tennessee	180,363	31,839	117,143	15,651	8,002	6,016	1,713	7,729
Texas	595,048	106,613	374,016	57,287	30,164	21,095	5,874	26,969
Utah	94,877	17,170	58,904	8,990	4,340	4,032	1,441	5,473
Vermont	19,184	3,330	12,534	1,569	765	716	271	987
Virginia	163,761	29,196	106,515	13,694	7,404	5,302	1,651	6,953
Washington	123,501	22,090	78,910	10,581	5,513	4,818	1,590	6,408
West Virginia	71,928	12,593	46,416	6,426	2,991	2,646	856	3,502
Wisconsin	126,988	22,001	83,863	9,505	5,466	4,643	1,511	6,154
Wyoming	13,589	2,467	8,545	1,220	612	554	191	745

Source: Sigma One Corporation, WIC Eligibility Study.

IMPLICATIONS FOR WIC PROGRAM COVERAGE

The present study has not examined extensively the relationship of the WIC-eligible population to WIC participation, nor analyzed the more detailed aspects of WIC benefit targeting that the eligibility estimates make possible. Nevertheless, certain broad implications of the estimated levels of WIC eligibility at the national level can be noted. The figures presented here refer to national average rates of WIC Program coverage. Individual States' levels of Program coverage and other aspects of benefit targeting may vary considerably from the national average estimates.

Table 18 shows the estimated percentage of the eligible population that was served by the WIC Program (the level of program coverage among eligible persons) in 1979 and 1984, and the change in WIC coverage between those two years.^{1/} In the earlier year an estimated 27 percent of the eligible population was served by the program, measured by average monthly WIC participation during the calendar year, and in 1984 an estimated 40 percent of the eligible population was served. The estimated overall rate of coverage among all categories of WIC eligibles thus increased by nearly 50 percent (48.7 percent) between those two years.

^{1/}FNS administrative data on WIC participation in the 50 States and the District of Columbia (monthly average for Calendar Years 1979 and 1984) were used for the categories of Infants, Children, and All Women. Participation in the detailed women's categories was estimated, based on the distribution of women enrolled in WIC, by category, in each period. Enrollment data for the earlier period were taken from the WIC Participant Profile Survey (FNS, Supplemental Food Programs Division, 1978) and for the later period from the Study of WIC Participant and Program Characteristics (FNS, Office of Analysis and Evaluation, 1986).

The estimated level of program coverage varies substantially among categories of WIC participants. In 1984, eligible breastfeeding women and children appear to have been relatively least served (27 and 32 percent respectively) while eligible pregnant and postpartum women and infants appear to have been most fully served (46 and 67 percent). On the basis of these estimates, it appears that the WIC Program does target its benefits to the two categories of persons of greater priority concern, pregnant women and infants.

TABLE 18

Estimated WIC Program Coverage of the Eligible Population, 1979 and 1984

WIC Participant Groups	Estimated Percent of Eligible Population Participating in WIC		Change in Estimated WIC Program Coverage, 1979 to 1984
	1979	1984	
Pregnant Women	27.3	46.1	+ 68.7%
Postpartum Women	39.5	46.5	+ 17.6%
Breastfeeding Women	11.5	27.1	+ 134.9%
All Women	26.7	41.5	+ 55.5%
Infants	42.5	66.9	+ 57.4%
Children	22.7	32.4	+ 43.0%
All WIC	26.8	39.9	+ 48.7%

Based on 1978 WIC Participant Profile Survey, 1984 Study of WIC Participant and Program Characteristics, administrative data for 1979 and 1984, and WIC Eligibility Study.

In terms of the relative improvement in benefit coverage between 1979 and 1984, the estimated participation rate among eligible breastfeeding women shows by far the greatest relative gain: from an estimated 12-percent coverage in 1979 to 27 percent in 1984, a more than doubling in WIC Program coverage over the period. Pregnant women show the next-greatest gain in rate of WIC participation between 1979 and 1984, an increase of more than two-thirds. By contrast, the estimated WIC coverage among eligible postpartum women (nonbreastfeeding) increased by less than 18 percent between the two years, considerably below the growth in coverage for all other categories of WIC eligibles.

Another aspect of targeting in the WIC Program at the national level is shown in table 19. This is the relative targeting of benefits by risk-priority level (i.e., medically based nutritional risk vs. dietary-only-based risk). For eligible pregnant and breastfeeding women, somewhat higher estimated participation rates are observed for higher-priority eligible persons (those at nutritional risk on medically based criteria) than among the lower-priority eligibles (at nutritional risk on dietary criteria only). For example, an estimated 47 percent of higher-priority eligible pregnant women were served by the program in 1984, compared to 40 percent of the lower-priority eligible pregnant women.^{2/}

This pattern differs for children, where WIC coverage of the higher-priority eligibles in 1984 was apparently lower than program participation among lower-priority eligible children. It also differed markedly for postpartum women at

^{2/}However, note the limitation described in table 19, note a. This apparent difference in coverage among higher- and lower-priority pregnant women may be misleading.

TABLE 19

Estimated WIC Program Coverage by Risk Priority Level, 1984

WIC Participant Groups	Estimated Program Coverage		
	Among All WIC Eligibles	Among Higher-Priority Eligibles	Among Lower-Priority Eligibles
Pregnant Women	46.1%	47.2% <u>a/</u>	39.9 <u>a/</u>
Postpartum Women	46.5%	n.a. <u>b/</u>	n.a. <u>b/</u>
Breastfeeding Women	27.1%	29.2%	23.4%
Infants	66.9%	67.1%	65.7%
Children	32.4%	30.3%	38.4%
All WIC	39.9%	38.6% <u>c/</u>	42.5% <u>c/</u>

Based on 1984 FNS administrative data, 1986 Study of WIC Participant and Program Characteristics (1984 data), and WIC Eligibility Study.

a/There is evidence that a particular limitation of the data available for estimating nutritional-risk frequency among women may have resulted in biased estimates for the numbers, specifically, of higher-priority and lower-priority pregnant women, tending to underestimate the former and correspondingly overestimate the latter. If this is so, the apparent difference in participation rate between these two particular groups is misleading. See below, Limitations of the Data and Estimates, for fuller description.

b/Not applicable in 1984 (all postpartum women certified at lower priority levels, by regulation, prior to 1985).

c/Totals excluding postpartum women.

that time, since prior to 1985 States did not have the option to certify eligible postpartum women under a high risk priority, and all postpartum women were assigned to lower priority levels. Under current regulations, by contrast, States have the option to certify postpartum women for high-priority nutritional risk (Priority Level III) and 22 States currently do so.

A further aspect of the broad benefit targeting achieved in the WIC Program is summarized in tables 20 through 22. This is the estimated rate of WIC participation in relation to the income/poverty level of eligible persons. As shown in table 20, it is apparent that WIC benefits are heavily targeted to the relatively poorest persons within the total eligible population. The program reached an estimated 53 percent of eligible persons below the poverty level in 1984, compared with 32 percent of those between 100 and 130 percent of poverty, and a 21-percent coverage of eligible persons between 130 and 185 percent of poverty.^{3/}

This relatively high coverage of the poorest eligible persons is particularly pronounced for infants, postpartum women, and pregnant women. Table 21 shows the estimated program coverage for each category of WIC-eligible persons with household incomes below poverty level. Based on data from the recent Study of WIC Participant and Program Characteristics (FNS, 1986), an estimated 87 percent of the eligible infants in homes below 100 percent of the poverty level were served by WIC in 1984 and an estimated 66 to 68 percent of the eligible pregnant and postpartum women below 100 percent of poverty were served.

^{3/}In all cases, the underlying census data and all related estimates are coded for income/poverty of: (1) below 100% of poverty, (2) from 100 to but not including 130% of poverty, (3) from 130 to but not including 185% of poverty, and (4) 185% or more of poverty.

TABLE 20

Estimated WIC Program Coverage by Income/Poverty Level, 1984

Household Income in Relation to Poverty Level	Estimated Average Monthly Participation	Estimated Number of Eligibles	Estimated Program Coverage
<100% of poverty	2,079,138	3,947,226	52.7%
100-130% of poverty	448,768	1,395,888	32.1%
130-185% of poverty	441,588	2,107,470	21.0%
All WIC Eligibles	2,969,494	7,450,584	39.9%

Based on FNS administrative data, 1986 Study of WIC Participant and Program Characteristics, and WIC Eligibility Study.

TABLE 21

Estimated WIC Program Coverage of Eligible Persons, 1984
by Target Population Groups Below 100% of Poverty

WIC Participant Groups	Estimated Average Monthly Participation	Estimated Number of Eligibles	Estimated Program Coverage
Pregnant Women	227,640	344,363	66.1%
Postpartum Women	159,968	235,230	68.0%
Breastfeeding Women	54,180	167,647	32.3%
All Women	387,608	747,240	51.5%
Infants	561,645	642,649	87.4%
Children	1,075,705	2,557,338	42.1%
All WIC	2,079,138	3,947,226	52.7%

Based on FNS Administrative data, 1986 Study of WIC Participant and Program Characteristics, and WIC Eligibility Study.

TABLE 22

Estimated WIC Program Coverage, 1984, for Eligible Infants and Pregnant Women, Cross-Tabulated by Poverty Level and Risk Priority

WIC Participant Subgroups	Estimated Average Monthly Participation	Estimated Number of Eligibles	Estimated Program Coverage
<u>High-Priority Pregnant Women:</u>			
<100% of poverty	209,234	291,339	71.8%
100-130% of poverty	42,045	136,972	30.7
130-185% of poverty	<u>44,278</u>	<u>197,558</u>	<u>22.4</u>
<185% of poverty	295,557	625,869	47.2%
<u>High-Priority Infants:</u>			
<100% of poverty	476,672	542,950	87.8%
100-130% of poverty	100,124	202,081	49.5
130-185% of poverty	<u>93,945</u>	<u>254,265</u>	<u>36.9</u>
<185% of poverty	670,741	999,295	67.1

Source: Sigma One Corporation, WIC Eligibility Study, FNS administrative data, and 1986 Study of WIC Participant and Program Characteristics.

Table 22 shows the estimated combined effects apparently being achieved by the WIC Program in terms of benefit targeting along several dimensions at once: by the participant categories of greatest concern (pregnant women and infants), by higher-priority nutritional risk (priority levels I-II), and by low income/poverty level (below 100 percent of poverty). On these estimates, it appears that on average in 1984 the program served 72 percent of the eligible pregnant women who were simultaneously at higher-priority nutritional risk and with below-poverty incomes, and 88 percent of the infants who were similarly in this situation of combined economically and medically based nutritional risk.

CONCLUSIONS

The new estimates of the fully eligible WIC population avoid the overestimation of WIC eligibles that is inherent in the methods and estimates available to date. The greater detail of the new estimates makes possible more complete analyses of WIC benefit targeting among population subgroups and somewhat more reliable assessment of WIC funds allocation in relation to need than previously were possible. The latter analysis (relative need among States and local areas, based on eligibility) is still limited essentially to the baseline period, since consistent data on income distributions for States and local areas are available only from the decennial census. However, the new estimates do provide a more precise and valid procedure for producing annual updates of the national WIC-eligible population than was available previously.

The estimated eligibility levels provide broad evidence of the WIC Program's effectiveness in targeting benefits to persons most in need: by category, by high-priority nutritional risk, and by income/poverty level. The new estimates also help to identify potential improvements in the WIC Program (e.g., better targeting of breastfeeding women and higher-priority children). The growth in program coverage since 1979 indicates an increased effectiveness of WIC in meeting needs within the eligible population.

Insofar as this study uses data not specifically designed to measure WIC Program eligibility, especially health and dietary survey data, its accuracy and reliability are limited to some extent. The estimates of people fully eligible under nutritional-risk as well as income criteria are limited both by the applicability of the available data and by uncertainty as to the relationship of the estimates to the process of actual WIC Program eligibility

determination in the field. Nonetheless, these estimates are the best that are available at this time.

LIMITATIONS OF THE DATA AND ESTIMATES

As with any estimates, the figures developed in the WIC Eligibility Study should be recognized as limited to some extent in accuracy and reliability. This is due primarily to limitations in the existing data sources as bases for making this particular estimation. Perhaps most important, neither of the national sample surveys used in estimating frequency of nutritional risk among lower-income women, infants, and children was designed to sample directly the WIC-eligible population as such. Consequently, the risk-frequency estimates obtained apply in a strict sense to proxy representatives for the WIC-eligible population, rather than directly to those specific population groups themselves.

This limitation is particularly important for the women's risk-frequency estimates derived from NHANES-II data. The numbers of currently pregnant, postpartum-to-6-months, and breastfeeding women in the NHANES sample are much too small to support reliable overall risk-frequency estimates for those groups directly (n = 108, 101, and 44, respectively). Consequently, the entire age group of potentially childbearing girls and women (ages 12-49, n = 4,161) was taken as a relevant proxy group for estimating nutritional risk frequency among WIC target-group women as a whole. This is likely to result in some estimation bias in the results derived from NHANES data, tending to misestimate the true frequency of nutritional risk for the specific WIC target populations, in particular, for women during pregnancy.

To the extent possible, the estimation method used in the study was designed to minimize the effect of this potential bias by adjusting for complex sample design. Nevertheless, some degree of estimation bias from this source is likely to remain in the results from the NHANES data. The National Natality Survey (NNS) data are not subject to this particular limitation. The large NNS sample of women and infants ($n = 7,484$) includes only women who recently had given birth, including significant subsamples of breastfeeding and nonbreastfeeding women, and including a number of the risk factors relevant to the woman's pregnancy as well as to her postpartum period (e.g., abnormal weight gain during pregnancy, high parity, closely-spaced pregnancies, history of complications and/or poor outcomes of pregnancy, smoking and alcohol abuse during pregnancy, and others). However, the NNS data are limited for estimating WIC nutritional risk in having no information on dietary intakes (apart from infants' breastfeeding). Thus, the NHANES-based findings still must be used in determining the estimated frequency of nutritional risk on dietary-only grounds for each WIC target group.

A second potential limitation of the 1980 National Natality Survey for WIC-related analyses is its omission of unmarried women from a substantial part of the data set. It is not known if this biases the results from NNS data as valid estimates for risk frequency within the WIC target population. If marital status as such influences nutritional risk prevalence, independent of its association with income, race and ethnicity, and maternal age, then a bias will result from the omission of unmarried women in the sample. Any such independent influence of marital status per se on women's nutritional risk has not been established. If such an influence does exist, the direction of bias this introduces cannot be predicted in advance.

The available evidence suggests that the degree of estimation bias in the final estimates of nutritional-risk frequency among WIC income-eligible women (drawn from both the NNS-based and NHANES-based results) is likely to be slight. First, the estimated frequency of medically based risk, averaged across all age groups among the census-based WIC income-eligible women, is nearly identical, as estimated from the two independent data sets (72.5 percent from NNS vs. 71.6 percent from NHANES-II). Among younger women, the estimated medically based risk frequencies are significantly higher in the NNS-derived estimates than in those from NHANES data. This does suggest an underestimation in the NHANES-based results for these particular age groups (12-18 and 19-26 years). However, for older women (age 27 and above) the NHANES-based estimates show higher medically based risk frequencies than those from the NNS data. This result apparently is due to the particular medical risk factors included in the NHANES data, several of which increase markedly in incidence with age (e.g., diabetes, renal disorders, high parity, hypertension).

For the two intermediate women's age groups (19-25 and 26-35, corresponding to approximately 80 percent of all WIC participating women) the estimated overall risk frequencies from the two data sets are nearly identical. For the two outlying age groups (under 19 and over 35) the greater divergence of estimated risk frequencies makes no direct difference for the estimated number of fully eligible women. This is because these two age categories themselves constitute risk factors for WIC eligibility: the frequency of risk under this criterion is 100 percent for each of these age groups in any case.

As a second validation for the NHANES-based estimates, a comparison was made of the overall frequency of medically based risk among the full NHANES-II sample of childbearing-age women and the small subsamples of WIC target-group women included in the data set. The results of these comparisons are shown in table 23. They indicate that for medically based nutritional risk the large proxy sample of women and girls does appear to underestimate the frequency of such risk for pregnant women. However, when diet-based risk is included along with the medically based risk criteria, the difference in overall risk frequency between the two sample-group estimates narrows appreciably, from 14 to less than 4 percentage points.

TABLE 23

Frequency of Nutritional-Risk Indicators in NHANES-II Data:
Comparison of WIC Target-Group Women and All Women Age 12-49

	Overall Risk Frequency Under WIC Modal Risk Criterion levels, for:			
	Pregnant Women (n=108)	Postpartum Women 0-6 mo. (n=101)	Lactating Women (n=44)	All Women Age 12-49 (n=4,161)
A. On any one (or more) <u>medically based</u> criterion	82.6%	73.2%	67.2%	69.0%
B. On <u>any</u> WIC risk criterion, <u>medical and/or diet-based</u> .	90.7%	85.7%	84.1%	86.4%

Source: Sigma One Corporation, WIC Eligibility Study.

Note: The risk frequencies here differ slightly from those estimated from the same data in the estimation of WIC-eligible population. These are weighted by NHANES-II sample weights to U.S. population totals, while the latter are weighted by the WIC income-eligible target group women from the 1980 census baseline data.

This result appears to be due to the fact that a large proportion of the women who are at risk under WIC medically based criteria in the NHANES data also are at risk under the modal diet-based criterion.^{1/} This suggests that a fair proportion of those pregnant women who are, in effect, "missed" in the estimation of medically based risk frequency from the larger proxy sample group are then subsequently "picked up" in the estimation of overall nutritional risk frequency under medical and dietary risk criteria together. On this indirect evidence, the estimates of overall nutritional-risk frequency, medical and diet-based together, may be somewhat understated for pregnant women as a whole, but only slightly at most. Rather, the validation test comparisons suggest a noneligible underestimate of the number of higher-priority WIC-eligible pregnant women from the NHANES data and an (approximately corresponding) overestimate of the number of lower-priority pregnant women.

The estimates of nutritional-risk frequency, and resulting numbers of WIC eligible persons, have another source of potential underestimation bias for each of the WIC target population groups. This is because neither the NHANES-II nor NNS data sets include the full range of nutritional-risk factors that are recognized in the State Plans (and in the "modal set" for each group) for defining WIC eligibility. The evidence suggests, however, that for all groups this particular source of potential bias is negligible.

^{1/}Two alternative definitions of the modal dietary risk criterion in the WIC Program, each widely represented in the WIC State Plans, were formulated, one based on 24-hour-dietary-recall data, the other on major-food-group-frequency data. The latter definition represents the modal State practice and was used in the final estimates of risk frequency from the NHANES data. However, preliminary tests indicated that the alternative definition of dietary risk produced very similar results.

Another potential problem for risk estimation should be noted, although its impact, if any, cannot be assessed. The determination of nutritional risk based on dietary inadequacy is much less precise than risk status defined with reference to most of the medically based risk factors. However, this is true for diet-based risk both as assessed in actual WIC certification interviews and as determined from the dietary component of the NHANES survey data. It is not known if any systematic discrepancy exists between these two different dietary determinations. A discrepancy of this kind would be a source of bias in the estimates. Such a bias, if it exists, could be substantial, given the large variability known to exist in dietary-intake survey data and likely to exist in WIC-clinic dietary-intake determinations.^{2/} The existence and direction of this possible bias cannot be predicted from the available evidence.

Other possible sources of bias stem from the use of the decennial census data in estimating the baseline numbers of persons income-eligible for WIC. The U.S. Census measures household income as prior-year annual income, while WIC eligibility certification is based on current, typically monthly, income. The known effect of using annual income data in estimating the number of households or persons below a given income limit is to understate the number of such households or persons for any given typical month within the year. On the other hand, Census income data are also known to be generally underreported to some extent. The effect of this is to overstate the number of households below

^{2/} Previous investigations have raised questions as to the accuracy of dietary criteria and their validity as indicators of nutritional risk. The present study does not address these more fundamental questions concerning the dietary criteria, nor any of the nutritional risk criteria, used in the WIC Program. Rather, it estimates the WIC-eligible population as it exists under the most prevalent risk criteria defined in the WIC operational State plans, through modeling these representative criteria as closely as possible from the existing survey data.

any given income limit. The combined effect of these two clear-cut limitations of the Census income data for estimating the WIC-eligible population has not been determined; however, the evidence of available studies suggests that the two are comparable in general magnitude. Consequently, since the two effects are opposite in direction, their combined net effect or bias should not be large.

Another source of bias can be identified in the use made of the census income/poverty data, and the magnitude of this particular bias can be estimated. The present study utilized the Census Bureau poverty-line concept in developing the special data extract from the 1980 Census, while WIC income guidelines conform to the DHHS/OMB U.S. Poverty Guideline. The Poverty Guideline is derived from the more detailed Census poverty line, but lags the Census measure by approximately 1 year. Consequently, in inflationary periods the Poverty Guideline is somewhat lower than the contemporaneous Census poverty line. Using the Census measure in place of the official Poverty Guideline then produces an overcount of households and persons below any given income/poverty limit. Based on Current Population Survey data, the magnitude of this particular overestimate amounted to an estimated 3 percent of all WIC target-group persons below 185 percent of the official Poverty Guideline in 1979. In projecting the 1979 baseline estimates to updated 1984 levels, correction was made for this overestimate of WIC eligible population in the underlying census data base.

Another related source of possible bias in using Census household income/poverty data to estimate the number of persons who would be income-eligible under actual WIC certification procedures was not estimated or corrected for. In WIC eligibility certification, the Poverty Guideline measure often is applied to the applicant's family or sub-family unit within the

household rather than to the household as such. FNS guidance to States recommends use of an "economic unit" concept in applying the poverty standard, which is likely to correspond more closely to the family unit than to the broader household in cases when the two differ.^{3/} To the extent this is so, use of household-based income/poverty counts will tend to underestimate the number of persons who would be determined income-eligible under actual WIC certification procedures.

A further possible type of bias in income/poverty data may affect the estimated numbers of WIC participants, rather than program eligibles, at alternative poverty income levels. The certifying incomes of WIC participants recorded in clinic files may tend to be underreported, especially in comparison with Census-reported household-level income data. To the extent this occurs, the number of WIC participants at the lower income/poverty levels, as estimated in the WIC Participant Characteristic Study, will be overstated. In this event, the present study's finding that WIC benefits are targeted heavily to the poorest participants also will be overstated to some extent.

Another type of limitation applies to the baseline estimates developed for States and local areas. The method of projecting nutritional-risk estimates to State and county levels utilizes the estimated relationships between WIC

^{3/}To distinguish these concepts, consider a mother and child sharing a dwelling with the grandmother and a fourth unrelated person. The household consists of all four persons, the family is the three related persons, and the mother and child constitute a related sub-family. The "economic unit" for WIC eligibility could be any of the above.

target groups' detailed socioeconomic characteristics and the frequencies of nutritional risk within the WIC target populations at the national level. The validity of the method depends on the assumption that these relationships themselves are reasonably constant across all areas of the country. This basic working assumption probably is generally valid at the State level and for larger county units. However, for smaller counties the estimates are necessarily less reliable. Moreover, for areas with particularly atypical populations (e.g., Indian State Agency areas, or communities with large recent immigrant populations) the basic assumption itself may not be valid.

Finally, the method used to derive current-period estimates from the 1979 baseline figures is limited in a particularly important respect. It measures changes in the WIC-eligible population based only on changing economic circumstances, as measured by the Census Bureau's annual CPS income/poverty data for the relevant target groups. The method is valid and produces reliable updates from the baseline figures for WIC eligibility on the assumption that the underlying relationship between economic circumstance and prevalence of nutritional risk remains relatively stable, or changes only slowly, over time. This assumption is reasonable, but can be tested only when the next round of health and dietary survey data becomes available from the planned NHANES-III and National Maternal and Infant Health Surveys.

The "bottom line" concerning the various data limitations is that their overall net biasing effect for the estimated number of WIC eligibles, on the available evidence, appears to be slight. As noted, there is evidence of some potential underestimation for pregnant women and infants, particularly for higher-priority

(medically at-risk) pregnant women. There is likely to be a corresponding overestimate for the number of lower-priority pregnant women (at risk on dietary grounds only). There also may be some underestimation of children's risk frequency and resulting number of eligibles owing to missing variables bias. Overall, however, the accuracy and reliability of both the baseline and current-period national-level estimates, and the baseline-period State-level estimates, may be regarded as acceptable for most uses.

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Dr. David L. Franklin and Marielouise W. Harrell, Sigma One, developed the estimation models used in the study. Harrell performed all estimations and the statistical determination of the weighted modal set of State WIC nutritional-risk criteria.

Dr. Cutberto Parillon, M.D., former Director of Nutrition, Ministry of Health in the Government of Panama, assisted in interpreting the medical and dietary data sets and in constructing the nutritional-risk indicator variables from the survey data corresponding to the modal WIC criterion levels for nutritional risk.

The study Advisory Panel provided essential advice in the design phase of the project and following an initial round of preliminary estimation results. The Panelists were:

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John Haaga, The Rand Corporation, (formerly Division of Nutrition Sciences, Cornell University);
Stefan Harvey, Center for Budget and Policy Priorities, Washington, D.C.;
Jerianne Heimendinger, North Eastern Regional Office, FNS, (former Director of Nutrition Services, Rhode Island Department of Health);
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Faye Wong, Division of Nutrition, Centers for Disease Control, U.S. Public Health Service; and
Nancy Zinneman, Chief, Nutrition Section, Connecticut Department of Health.

Jean-Pierre Habicht, Cornell University, provided comment on the design of the nutritional-risk estimation model.

Dr. Gary W. Bickel authored the final report of the study. Leighton C. Ku, FNS Office of Analysis and Evaluation, contributed substantially to the final form of the update projection model used in the study. Close critical reading of all drafts was provided by Mr. Ku and by Clara L. French of the FNS Supplemental Food Programs Division. Catherine M. Brown and Shirley Hutchens of the FNS/OAE staff carried out production of the final report.

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